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CRATER LAKE, OREGON.

BY EARL MORSE WILBUR.

Crater Lake, lying on the very summit of the Cascade Range in Oregon, about sixty-five miles north of the California line, is without doubt the most remarkable body of water on the continent, whether regarded as scenery or as an object of scientific interest. Capt. C. E. Dutton, U. S. A., who had charge of the government survey of it made in 1886, reported at that time that it was destined to become famous throughout the world when it should become better known and understood. But although its existence has been vaguely known for more than forty years, its remoteness and difficulty of access have prevented any considerable numbers from visiting it, beyond those living in its near vicinity. The past summer the Mazamas, a society in Portland, Oregon, devoted to the exploration and study of the northwestern mountains and their scenery, organized an excursion of 500 to 1,000 people to the lake.

The lake itself is only one of the many crater lakes in different parts of the world, the best known of which, perhaps, are those in the Eifel, in Central Italy, and in Auvergne. These, however, are all small. Larger is the very remarkable lake in the island of Niuafou, between the Fiji and Samoan Islands; the island being only the exposed rim of an old crater, whose center is occupied by a lake two miles in diameter, of unknown depth, and ninety-five feet above the sea. Crater Lake is more extraordinary than even this. The breadth and angle of its sides show that where the lake now is there must once have been a volcano at least 14,000 or 15,000 feet high—that is, about the height of Mount Shasta. The gorges made by its great glaciers are still easily marked; and the present rim of the lake is composed of its lava. Undoubtedly by a great subsidence (because the surrounding country shows no evidences of so great an explosion) the whole mountain crest disappeared; and its place is now occupied by a lake of elliptical shape, 6¼ by 4¼ miles. The surrounding walls rise to height of from 1,000 to 2,000 feet, and are so steep that a descent is impossible except in two or three places. The highest elevation of the remaining rim is 8,238 feet above the sea; and the surface of the lake is 6,239 feet above the same level. Careful soundings show that there is a maximum depth of 1,996 feet, with a general mean depth of floor of about 1,600 feet. The lake is thus 500 feet deeper than Tahoe, which it resembles in several notable respects, and, therefore, the deepest water on the western continent; although the Caspian has been sounded to a depth of 3,000 feet and Lake Baikal to 4,504 feet.

From the floor of the lake rise three well marked cinder cones, two entirely under water and the third forming Wizard Island, 845 feet high, and having its own crater, 150 feet deep. The water of the lake is of the most remarkable deep blue color, and so clear that the bottom can be seen at a depth of over 100 feet. The lake has no visible outlet or inlet, and is undoubtedly fed from the precipitation in the immediate vicinity. A water gage established by the Mazamas this year shows that the water slowly but very steadily falls as the summer progresses.

The expedition of the Mazamas had something of the nature of a scientific expedition. Parties from the Geological Survey, the Biological Survey, the Fish Commission and the Division of Botany were there from Washington and made a special study of the lake and its vicinity, and many other scientific men were present from different parts of the country. The geology of the region offers problems of the greatest interest for solution; the fauna is said to be the most interesting of any part of the Cascades, the Biological Survey obtaining several undescribed species there this year, and the splendid specimens of conifers attract the botanist unusually. It was believed until this year that the lake contained no animal life; but the investigations of the Fish Commission showed that, while no fish were present, there were several species of small crustaceans and an abundance of other fish food. The lake will be at once stocked with trout.

CRATER ISLAND IN THE GREAT LAKE ON SUMMIT OF CASCADE RANGE, OREGON.

The most important discovery, however, was that made in taking temperatures of the water. It was found that while the surface temperature was 61° Fah., at 555 feet the minimum of 39° was reached, and that below that the temperature gradually rose until at the bottom, at 1,650 feet, it was 46°. The conclusion is almost irresistible that this curious phenomenon is due to the presence of very considerable volcanic heat.

The weirdness and grandeur of the lake itself have so focused attention that it had been forgotten that the mountain on which it is situated, although over 8,000 feet high, had never had a name. It has now been formally christened Mount Mazama, in honor of the vanishing genus of mountain goat, from which the society mentioned above takes its name. The Geological Survey have lately published a large scale map and description of Crater Lake, and the place is sure before long to be known as one of the greatest scenic attractions of the country.

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(Illustrated articles are marked with an asterisk.)

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For the Week Ending December 5, 1896.

Price 10 cents. For sale by all newsdealers.

A NOTABLE EVENT IN AMERICAN SHIPBUILDING.

It is not putting the case too strongly to say that no event in the history of American shipbuilding has had greater significance than the recent placing of an order by the Japanese government with the Cramps Shipbuilding Company, of Philadelphia, and the Union Iron Works, of San Francisco, for the construction of two war vessels. It marks a forward step in the development, or rather rehabilitation of our maritime interests, as notable in its way as the floating of the first steel cruisers of our new navy some dozen or more years ago, or the recent successful trials of our three first-class battleships during the past twelve months.

The action of the Japanese government in intrusting the building of two of the crack ships of its present programme to American builders proves that the uniform excellence of the ships and material which have been turned out of American yards has had its effect. It means that, in the estimation of the youngest and most progressive of the naval powers of the world, our work is fully up to the standard of the oldest and most experienced yards of Europe. Not, however, that we needed any such indorsement. Ships like the battleship Indiana, the armored cruiser Brooklyn, and the protected cruisers Minneapolis and Columbia, are as fine vessels of their class as are to be found afloat to-day; but, still there is one circumstance which gives special importance to the action of the Japanese in placing this order with us, and this is that they have but lately emerged from a war in which their victories were won by the type of vessel which they are now having built in American yards. They are, therefore, specially qualified to judge of its value, and would naturally wish to place the order with those firms which are best qualified to carry it out.

The contracts were awarded after mature deliberation, and a thorough consideration of plans submitted by European builders, the Japanese commissioners having first visited the various shipbuilding yards in this and other countries.

The new ships will be 405 feet long, with 45 feet beam, and about $17\frac{1}{2}$ feet draught, the normal displacement being 4,760 tons. They will have high speed—about $22\frac{1}{2}$ knots—and will be heavily armed, carrying two 8 inch guns of the semi-rapid fire type, ten 4·7 inch rapid fire guns, twelve 12 pounders, two 6-pounders, and two $2\frac{1}{2}$ pounders. It will be seen that they are enlarged Yoshinos, a type of swift, powerfully armed cruiser, of moderate size, which rendered good service in the operations of the late Chinese war.

There is every reason to expect this successful competition of our home yards with those of the world will open the way for an extended connection with those countries whose navies are built abroad. Japan itself is evidently aiming at naval supremacy in the Pacific, and will undoubtedly call for ships faster than her yards can supply them, and the various South American republics are entirely dependent upon foreign shipbuilders for new vessels. Our great shipbuilding concerns on the Atlantic and Pacific coasts are advantageously placed for competition. They are nearer in some cases by many thousands of miles, and we have, moreover, all the advantage which our excellent relations with these peoples, especially on the southern continent, undoubtedly gives us.

The securing of these contracts is another evidence of the wisdom shown by the government in decreeing that the ships of the new United States navy should be built in American yards and entirely of American material. It required some courage to do this at a time when the cost of building warships was much greater in this country than in Europe, the art being yet in its infancy. And yet in no other way could the naval shipbuilding industry have been resuscitated in this country. The enormous first cost of the necessary plant for the manufacture of armor and machinery would have prevented any private corporation from undertaking its erection, unless they were sure that a certain amount of orders would be forthcoming each year. And, although the earlier ships were costly, it was not long before the many improved and labor-saving methods which American establishments introduced into the manufacture of ships, guns and armor enabled them to make a rapid reduction in the price of their bids for government work. This was shown at the bidding for the last three battleships authorized by Congress, when the prices showed a reduction of from twenty to thirty per cent over the cost of the earlier battleships contracted for a few years before.

Incidentally it should be mentioned in this connection that there is no greater stimulus to the creation of a merchant marine than is offered by a liberal policy of naval shipbuilding. The costly plant, the expert workmen and the skilled designers which are essential to the success of naval yards, whether public or private, exercise a powerful stimulus upon the general shipbuilding interests of the country. The firm that can build an Indiana or a Massachusetts is well equipped for the construction of a St. Paul or a St. Louis. There ought to be no reason why we should not compete for Atlantic liners as successfully as we have done for these Japanese warships. If we cannot at present build the large ocean steamer as cheaply as the English and German firms, there is every reason to hope that we soon shall do so. At the last visit of the British ironmasters to this country they freely admitted that manufactured product was turned out more cheaply in this country than was possible at home, and this in spite of the higher wages. They attributed the difference to improved machinery, skillful administration and greater efficiency of labor. There is no reason to suppose that we have reached the limits of progression along these lines in our shipbuilding industry, and it is reasonable to look for a time, not far distant, when orders for European passenger and sailing ships will be freely placed in American yards.

GOOD LOCOMOTIVE PERFORMANCE WITH HEAVY LOADS.

On the occasion of a recent trip by our representative from Philadelphia to Jersey City over the Pennsylvania Railroad, some exceptionally good running was done by the company's well known compound locomotive No. 1515. The train consisted of thirteen cars of more than average weight, as will be seen from the accompanying figures, and it was hauled over the division in two hours and twelve minutes, or one minute less than schedule time.

In reply to our inquiry, Mr. Thomas U. Ely, chief of motive power, writes us:

"This locomotive is a compound, and was built in 1892 as an experiment to enable us to get some information in regard to the compounding principle. It was the first locomotive with seven foot driving wheels built in modern practice up to that time. It has done excellent work and seems well adapted to hauling heavy trains at a high speed.

"The train on which your representative rode from Philadelphia to Jersey City on October 4 consisted of thirteen cars, as follows:

	Weight of Equipment. Pounds.	Weight with Lading. Pounds.
Two sleeping cars	190,000	197,500
Three coaches	196,800	216,300
One dining car	95,000	96,000
Two mail cars	125,600	201,600
One baggage car	55,000	95,000
Four express cars	210,400	330,400
Totals	872,800	1,135,800
Locomotive		145,500
Tender		77,000
Total weight of train		1,358,300

"The steam pressure was 205 pounds."

No. 1515 is a two cylinder compound, with two outside cylinders, $19\frac{1}{2}$ and 31 inches in diameter, with 28 inch stroke. It has piston valves $12\frac{1}{2}$ inches in diameter, which are placed in the saddle within the frames, and, therefore, between instead of on top of the cylinders. The hurricane deck is carried at the level of the cab floor and just clears the top of the cylinders, being curved down in front of them to the regulation height of an ordinary pilot. The boiler is of the Belpane pattern, with a firebox 3 feet 4 inches wide and 9 feet long. The drivers are, as stated, 7 feet in diameter, and as the boiler is 65 inches in diameter, it is necessarily carried very high, the center being 9 feet above the rails.

The truck wheels and those under the tender are unusually large, 42 inch, the tender being of the English type, six wheeled, with a rigid wheelbase. It weighs 77,000 pounds when loaded with 3,000 gallons of water and 15,000 pounds of coal.

Referring again to the table of weights, it will be noticed that 568 tons were hauled for a distance of 90 miles at the rate of over 40 miles per hour, and we are informed that the locomotive was working well within its maximum power. This is as fine a performance in hauling a heavy train at express speed as has come within our notice, and it proves that there are certain classes of work for which the compound is specially adapted. Recent experience both in this country and abroad seems to establish the superiority of the simple engine for exceptionally high speeds, and it is significant that in the recent racing from London to Scotland the latter type did most of the work. At lower speeds, and with heavier loads, the compound begins to show an economy.

A New Harbor Mail Transport.

The plan begun last August of having the foreign mails transferred to special tugs while the steamers were detained at quarantine, and transported to the various railway terminals direct without going to the New York office and then to the respective transportation lines, has operated so well during the past few months that the post office department at Washington will recommend to Congress the building of a special mail transport boat of rapid speed fitted up with sorting bins and tables similar to the present railway mail cars, which will meet incoming vessels and take the mails off at quarantine. Then on the way up New York Harbor the clerks will quickly distribute and sort the mail matter intended for the different roads. It is calculated much time will be saved in this way and a more prompt delivery of the mails insured. The proposed vessel is to cost $40,000.

THE HEAVENS FOR DECEMBER.

BY WILLIAM R. BROOKS, M.A., F.R.A.S.

THE SUN.

The sun's right ascension on December 1 is 16 h. 33 m. 44 s.; and its declination south of the celestial equator is 21 deg. 58 m. 26 s.

On the last day of the month its right ascension is 18 h. 46 m. 7 s.; and its declination 23 deg. 1 m. 51 s. On the morning of December 21 the sun reaches its greatest southern declination, 23 deg. 27 m. 13 s. On that date also it enters Capricornus and winter is said to begin. It will be seen from the above that, even by the last of the month, the sun has returned northward nearly half a degree from its most southern dip.

Sun spots are rather infrequent just now, but an occasional fine group will reward the faithful telescopic observer.

MERCURY.

Mercury is evening star, but, having been in superior conjunction with the sun only two days before the month opens, it will not be visible until the latter part of December, when it must be looked for soon after sunset and near the sunset point.

On December 1, at four o'clock P. M., Mercury is in aphelion, or in that part of its orbit which is most distant from the sun. This must not be confounded with Mercury's greatest elongation from the sun as seen from the earth, which is, of course, an entirely different thing.

Mercury is in conjunction with the moon on December 4, at 7 h. 16 m. in the evening, when the planet will be 3 deg. north of the moon.

The right ascension of Mercury on December 1 is 16 h. 46 m. 48 s.; declination south 23 deg. 33 m. 20 s.; and on December 31 its right ascension is 20 h. 3 m. 46 s., declination south 22 deg. 10 m. 59 s.

VENUS.

Venus is evening star, and although its great southern declination robs it of much of its prestige, it is nevertheless a most regal object in the southwestern heavens.

No one can mistake this peerless celestial gem on the warm bosom of the early night.

Interest has been revived in the question of the axial rotation periods of Mercury and Venus by a recent announcement from Mr. Percival Lowell's observatory at Flagstaff, Arizona.

The result of his observations leads him to think that these planets make but one axial rotation in performing a revolution about the sun, thus confirming the work of the noted Italian astronomer Schiaparelli, who came to a similar conclusion about six years ago. Further particulars from the Lowell Observatory, which has unsurpassed facilities and conditions for these delicate observations, will be awaited with great interest.

Venus crosses the meridian on December 1, at 2 h. 29 m. in the afternoon, and sets at 6 h. 58 m. P. M.

On December 31 it crosses the meridian at 3 o'clock in the afternoon, and sets at 8 h. 2 m. P. M.

MARS.

Mars is in the eastern evening sky, on the first of the month rising soon after sunset, and is well placed for telescopic observation a few hours later. Its great northern declination is especially favorable.

Mars comes into opposition at midnight, on December 10, and it will be then at its nearest approach to the earth for this apparition. While the wonderful so-called canals must be left to the great telescopes, much detail can be seen on the planet with good instruments of moderate aperture under proper conditions of the atmosphere, or in "good seeing" as astronomers say. Much also depends upon good eyesight—a trained and educated vision. This usually comes with years of practice. Mars rises on the first of the month about 6 o'clock in the evening, and reaches the meridian three-quarters of an hour after midnight. On the last day of the month it rises at 5 h. 40 m. P. M., and reaches the meridian at 10 o'clock P. M. The right ascension of Mars on December 15 is 5 h. 6 m. 6 s.; and its north declination 25 deg. 39 m. 8 s. Its apparent motion is slowly retrograde through the constellation Taurus.

JUPITER.

Jupiter is in the morning sky, in the constellation Leo, and about twelve degrees eastward from the bright star Regulus in that constellation. Jupiter may now be observed telescopically to good advantage, reaching a fair altitude by three or four o'clock in the morning. Its wonderful belts and spots are already being studied by the enthusiastic students of this giant planet. Four of its moons will afford delightful and ever-changing telescopic pictures; while later, as it sweeps into nearer reach, the great instruments will attack the difficult fifth satellite.

I name herewith some of the interesting phenomena of the satellites which may be observed in December. On the early morning of December 2, the I satellite will transit, ingress at 1 h. 30 m. Egress of its shadow at 2 h. 35 m. Egress of the satellite at 3 h. 50 m. On December 3, at 1 h. 6 m., the I satellite will reappear from an occultation. On December 4 the IV satellite will disappear in eclipse at 3 h. 3 m. 38 s. On December 6 the shadow of the III satellite will ingress at 4 h. 15 m. On December 16, at 4 h. 2 m., the shadow of the I satellite will enter on the disk. Ingress of the satellite I at 5 h. 14 m. Egress of the shadow of I at 6 h. 22 m. On December 21, at 1 h. 36 m. 44 s., satellite IV will reappear from an eclipse. On December 26 satellite I will reappear from an occultation at 1 h. 5 m.; and likewise satellite II at 2 h. 35 m. On December 31, at 5 h. 5 m. 28 s., satellite I will disappear in eclipse. At 5 h. 19 m. will occur the ingress of the shadow of satellite II; and at 6 h. 12 m. 40 s. satellite III will disappear in eclipse. It is understood that all these times are morning hours. On Christmas Day, at noon, Jupiter will be in conjunction with the moon, the planet being 3 deg. 38 m. north of the moon.

On December 1 Jupiter rises at midnight and crosses the meridian at 6 o'clock A. M. On December 31 it rises at 9 h. 35 m. and crosses the meridian at 4 h. 4 m. A. M. Through the latter part of the month Jupiter is apparently nearly stationary. On December 15 its right ascencions is 10 h. 48 m. 7 s.; declination north 8 deg. 47 m. 23 s.

SATURN, URANUS AND NEPTUNE.

Saturn and Uranus are near each other in the morning sky, but too near the sun for good telescopic study. They are in conjunction on the morning of December 28, when Saturn will be 1 deg. 49 m. north of Uranus.

Neptune is in opposition to the sun on December 10, when it rises at sunset, and is well placed for telescopic observation later in the evening. The right ascension of Neptune on December 1 is 5 h. 13 m. 12 s., declination north 21 deg. 34 m. 4 s. On the last day of the month its right ascension is 5 h. 9 m. 30 s.; declination north 21 deg. 30 m. 9 s.

Smith Observatory, Geneva, N. Y., Nov. 21, 1896.

The Shore Road Drive in Brooklyn, N. Y.

Of all the many picturesque drives around New York Bay, there is none that presents a series of prettier marine pictures than can be seen from what is known as the Shore Road, which follows the meander of the eastern shore of the bay, from picturesque Bay Ridge, at Bay Ridge Avenue, to Fort Hamilton at the entrance of the Narrows. The present road, which has ever been a favorite haunt of the citizens of Brooklyn, follows very closely the sharp curvature and abrupt grades of the bluffs which overlook the bay at this point, and while these features may enhance the romantic beauty of the spot, they are too pronounced to be suitable to the necessities of a public driveway. The road, moreover, is at its best narrow and indifferently maintained.

The city commissioners have lately taken steps to improve the present road and turn it into a driveway similar to the well known Riverside Drive and Speedway in New York City, and the splendid twelve mile stretch of road in New Jersey known as the Hudson County Boulevard. The proposed improvements are to be carried out on a lavish scale, as may be judged from the fact that the preliminary purchase of the strip of water front, including the proposed road and lying between it and the bay, will cost in the neighborhood of two and a half million dollars. The water front thus acquired will be placed under the care of the Park Department of Brooklyn.

The work will be commenced at the Bay Ridge end, and in general the line of the existing road will be followed, the curvature being reduced and the grades lightened. The scheme provides for a fifty foot driveway, with a sidewalk six feet wide on the inside for the use of residents along the route. On the shore side of the road, immediately joining it, will be a strip of grass eight feet wide, planted with shade trees, and then a walk sixteen feet wide immediately on the edge of the bluffs. This plan will be followed as far as Ninetieth Street. From there to Fort Hamilton there will be a drive thirty feet wide along the top of the bluffs and another forty feet wide at the edge of the water. There will also be a sixteen foot walk and a twenty foot bicycle path at the edge of the water, which will follow the shore line for the whole two and one-quarter miles from Bay Ridge Avenue to the fort.

The ground between the driveways and walk on the bluffs and the shore line walk and bicycle path at water level will be tastefully sloped, terraced and planted. At the north end the drive will connect with a parkway, which is to be constructed from First Avenue to Fort Hamilton Avenue, and which, in order to avoid interruptions from surface line traffic, will be carried by tunnel or bridge across the intervening avenues from First to Eighth inclusive.

The work is being carried out under the care of Edwin C. Swezey, C.E., with William Jackson, C.E., of Boston, Mass., as consulting engineer.

The Testing of Smokeless Powders.

In the SUPPLEMENT for the current week (No. 1092) will be found a very interesting article on the testing of smokeless powders by Mr. Griffith, who has had a very extensive experience. This article is published by special arrangement with the English journal Arms and Explosives, and is specially recommended to all who are interested in explosives.

Mechanical Devices that Bring Evils in Their Train.

Just as the inventive genius of the age has forced novelties into the higher professions, and the expert mechanic finds his field growing larger continually, so the physician sees new or special diseases confronting him resulting from new conditions in modern life. These new diseases receive names from the lay world which are adopted by the scientific people.

Among the new maladies, says the New York Daily Tribune, which the physicians attribute to recent mechanical and scientific inventions is the "trolley foot." The motorman on electric and cable cars rings the warning gong by pressing his foot upon a knob or button, and it is said that the constant pressure produces an ailment which had never been known until the new cars came into use.

"In the first place," said a motorman, "it wears out the shoe quicker than you have any idea; but that's the shoe's fault. Then, tapping the knob produces a tickling sensation at first, and then the foot gets inflamed. Of course, we know that it can't be anything serious, and keep right on kicking the thing, and after a few days the inflammation wears off, the skin gets hard and we think it's all over and that we'll have no more trouble. But that's a mistake. Shooting pains and nervous twitchings follow, and these are worse when one is off duty then when kicking the gong." It was explained that in most instances the difficulty wears away, but that "trolley foot" had caused many men to quit the service of the railroad corporations.

Telephone ear, as a result of constant use of the telephone, has given the ear specialists considerable work. The structure of the ear is not in any way affected by the use of the instrument, but the unnatural use of the organ frequently causes a nervous strain, which is reflected in the aural nerves. When asked about the cure for the telephone ear an otologist said:

"I have never seen a case which was not cured in a short time after the cause was removed. When the patient stops using the telephone, the ringing noises and the headaches soon disappear."

Bicycle back and bicycle toes are among the ills which are charged to the improper use of the bicycle. "The man or woman," said a physician, "who doubles up on a wheel cannot escape the 'bicycle back' if he lives long enough, and the coward on a bicycle is apt to contract the 'bicycle toe,' which results from 'curling up' the foot. It is a strange thing," he added, "but it is true that the nervous rider, who constantly thinks he is about to tumble, will have excruciating pains in his toes after a short ride, and he will be troubled in that way until he gains confidence enough in himself to stop the nervous contraction of his feet. As to the 'bicycle back,' it is simply a natural consequence. The men who work in mines and who are compelled to stoop for hours at a time have what is known as 'miner's back,' which is identical with 'bicycle back;' but while we pity the miners, we condemn the wheelmen."

Telegrapher's cramp is another one of the modern complaints. It results from the manipulation of the telegraphic key, and affects the sufferer in the same way as writer's cramp. The fingers which are used on the key and the whole forearm are frequently made useless, and are restored to a normal condition only after scientific treatment by gymnastics and massage.

Typewriter's cramp is much like the telegrapher's cramp, but as both hands are used in writing on the machine, so both hands are often involved in the abnormal condition.

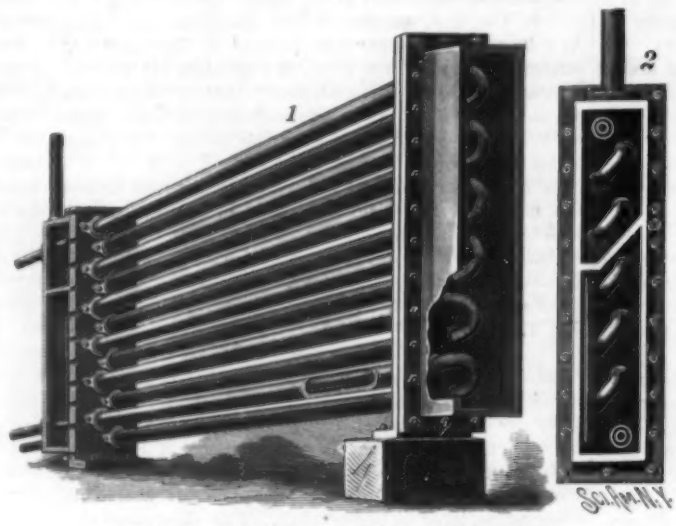
The Convention of the American Society of Mechanical Engineers.

The New York convention of the American Society of Mechanical Engineers was opened on the evening of December 1, when Mr. John Fritz delivered the presidential address, taking for his subject "The Progress in the Manufacture of Iron and Steel in America, and the Relations of the Engineer to it." The papers which are periodically read at these meetings form some of the most valuable contributions to the technical literature of the country, and it is needless to say that the contributions on this occasion were fully up to the traditions of the society.

By the courtesy of the secretary, Mr. F. R. Hutton, we are enabled to print the first paper of the series in the current issue of the SUPPLEMENT. It is from the pen of Sir Henry Bessemer and is entitled an "Historical and Technical Sketch of the Origin of the Bessemer Process." The distinguished metallurgist gives in full detail the various steps by which he was led to the discovery which has made him famous; and the recital is rendered very clear by copious illustrations, among which are cuts of the reverberatory furnace in the operation of which he first observed the possibility of decarbonizing cast iron solely by the air blast, and also of his early converters. The paper is timely, and in view of the recent discussion of Bessemer's claims to the process, will excite widespread interest. In subsequent issues of the SUPPLEMENT we shall publish several other papers from the series that were read at the late convention.

THE CONDENSATION OF AMMONIA GAS.

The illustration represents a condenser of simple and inexpensive construction in which the operation of condensing ammonia gas may be more rapidly carried on than has been generally practicable heretofore, the condenser being also adapted for use as a brine cooler. The improvement has been patented by John D. Smith, of No. 633 Amsterdam Avenue, New York City. Fig. 1 shows the condenser in perspective, with portions broken out, and Fig. 2 is an inside view of the front header. The headers are connected by staggered condensing pipes, all inclined downward from the rear to the front header, and leading through the lower portion of the front header is a water pipe which extends back and forth through the whole series of condensing pipes, and has an outlet at the upper end of the front header, the water pipe being of considerably less diameter than the condensing pipes. The front header, as shown in Fig. 2, has a transverse inclined partition, from which a pipe leads downward, designed to carry the condensation which takes place above the partition to a point of discharge into a suitable receptacle near the lower end of the front header, the partition preventing the passage of gas to the lower portion of the header.



SMITH'S AMMONIA GAS CONDENSER.

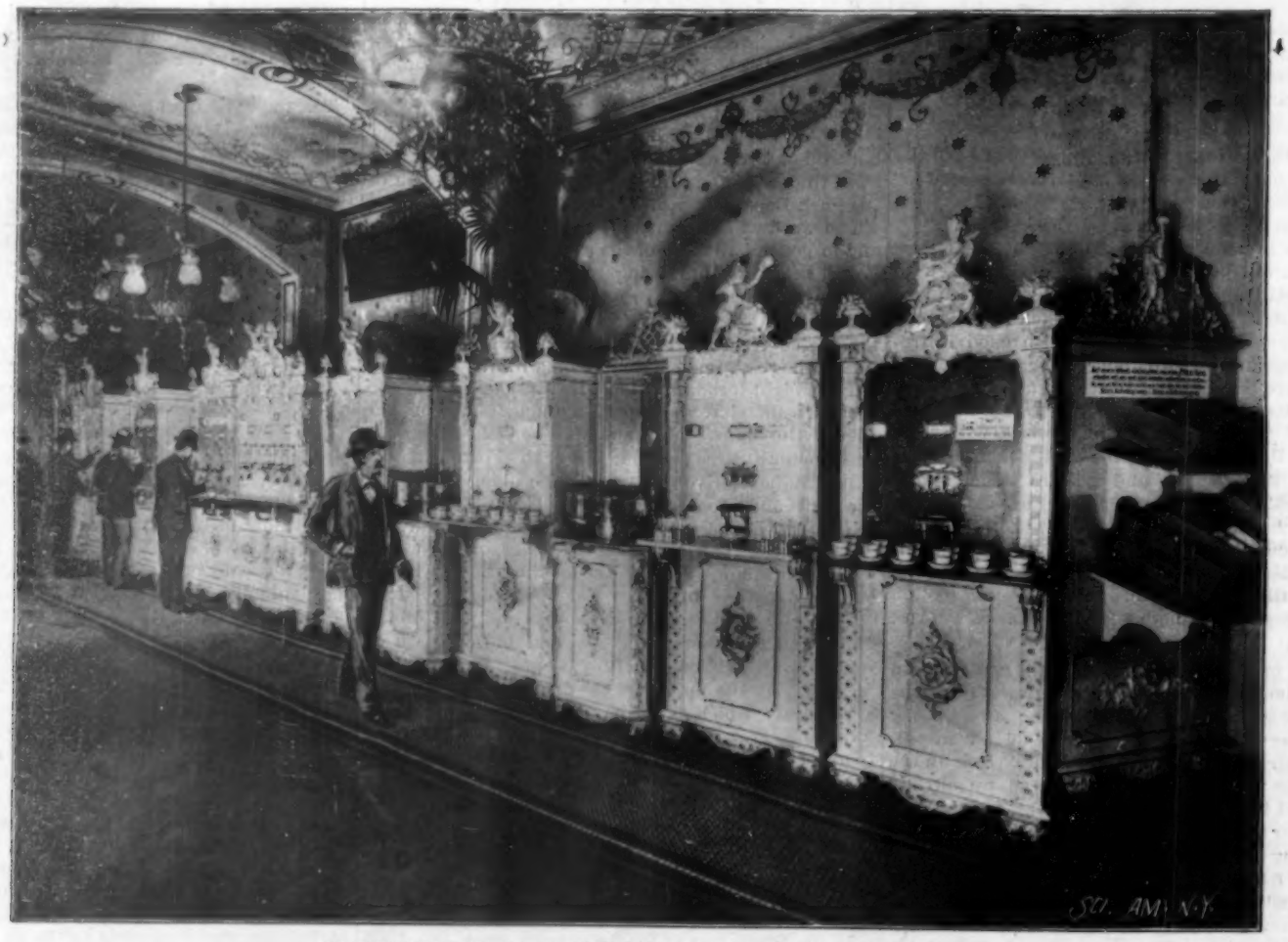
The gas entering by the vertical pipe at the top of the front header circulates or passes into the condensing pipes above the partition, while the flow of water through the water circulating pipe very rapidly condenses the gas under a very low pressure. A large portion of the gas is condensed in the pipes above the partition, and the ready outflow of the condensation prevents the clogging of the pipes that so frequently happens in other forms of condensers. For the comparatively small amount of gas passing to the lower pipes, the condensation is carried to a bottom outlet of the front header. In using the device as a brine cooler this outlet is dispensed with, and the apparatus is placed in a tank of brine suitable for storage supply, the ammonia being expanded in the bottom of the front header. The evaporation of the ammonia in the outer pipes, which are in communication with the brine in the tank, is rapid, and the evaporation acts directly on the surface of the inner pipes, through which the brine is passing, the capacity of the gas for the absorption of latent heat being thus completely utilized.

THE AUTOMATIC LUNCH COUNTER.

One of the most elaborate applications of the "nickel-in-the-slot machine" is that which forms the subject of the accompanying illustration, which shows the interior of a café in the Potsdamerstrasse, Berlin, equipped with automatic lunch counters. There are several establishments of the same kind in this and other German cities which are controlled by what is known as the Quisisana Company. It will be seen from the illustration that in place of the ordinary counter served by waiters there is a set of ornamental cabinets ranged along one side of the room which have a shelf projecting at a convenient height, upon which are placed the necessary glasses or cups. Above the drinking vessels are the faucets and a slot to receive the coin. The customer places a glass or cup beneath the faucet bearing the label of the drink which he desires and the money is inserted in the slot. The apparatus will then automatically, without further action of the buyer, deliver the liquid. The establishment in question offers a customer the choice of a large variety of drinks, the various liquors being obtainable at all seasons of the year, and the iced drinks of summer being replaced by a variety of hot drinks in the winter.

The liquors, etc., are kept in glass vessels and the hot drinks in nickel tanks surrounded by a hot water bath which is heated by gas. In order to insure perfect cleanliness, no rubber is used, the liquids being conducted to the faucets through silver tubing. The measuring out of the drinks is controlled by clockwork located within the casing of the stands. Each stand is provided with an automatic spraying nozzle for cleaning the cups and glasses. It is located in the center of a disk which is provided with a groove to receive the rim of the inverted glass. Upon pressing down, a spray of water rinses out the vessel.

The eatables, such as sandwiches, cakes, etc., are contained beneath a large bell glass, as shown in the third stand from the right. The glass contains about one dozen sandwiches, each of which is placed in a paper dish. They are arranged in a circle upon a revolving tray, and whenever the purchase coin is put in the slot the tray revolves far enough to bring a sandwich opposite an opening through which it is automatically presented to the purchaser. Other stands provide hot chicken, beef or other meats, and, indeed, the Quisisana café has a bill of fare which would compare favorably in point of variety with a first-class restaurant of the common type.



AUTOMATIC LUNCH COUNTER, WITHOUT WAITERS.

Production of Amber.

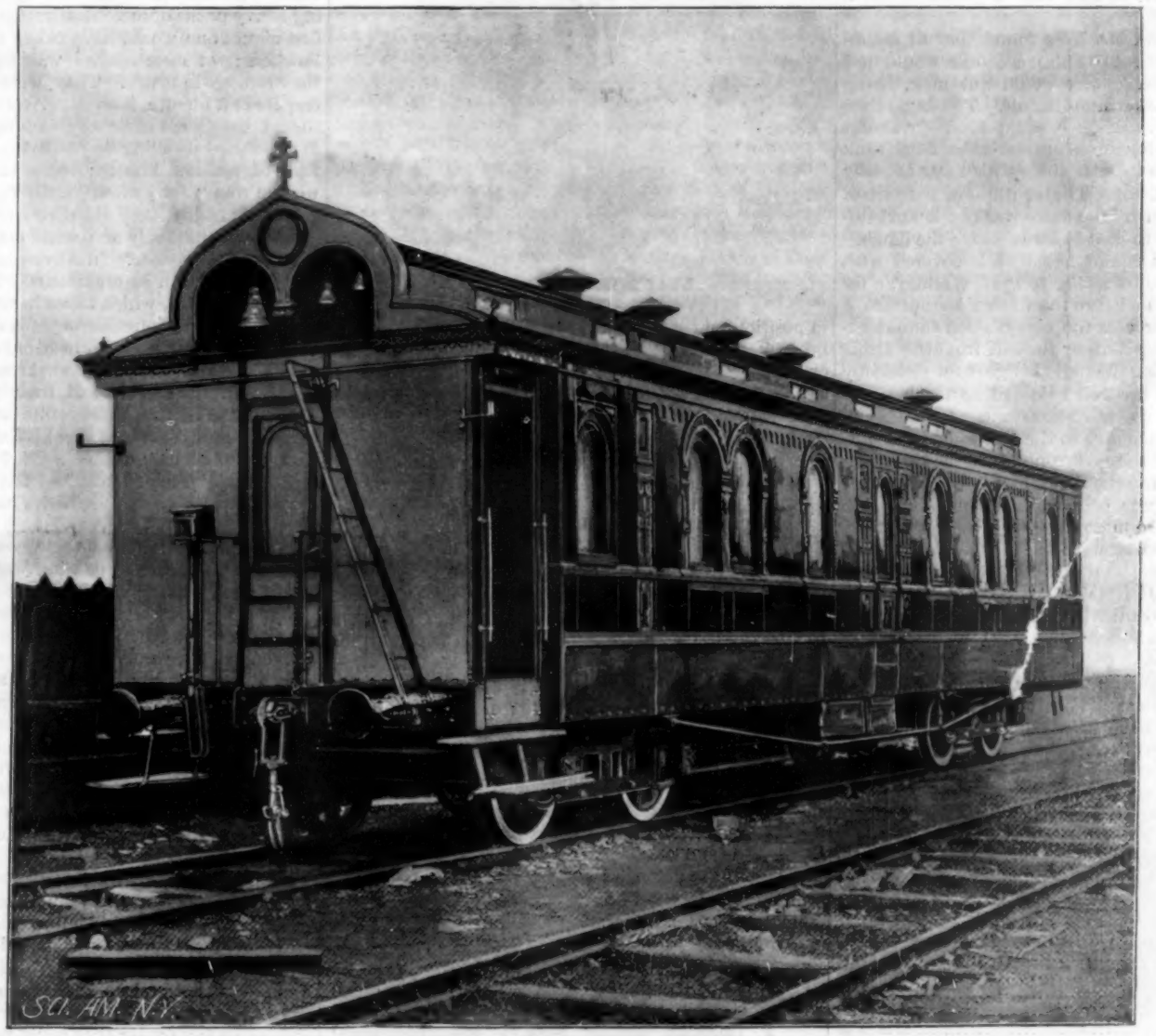
The working of amber in Prussia is a monopoly in the hands of a firm who own the two best mines, Palmnicken and Kraxtepelle. For the concession they have, according to Consul Hunt, of Dantzig, to pay to the German government a royalty of 650,000 marks (about $162,000) a year. It is reckoned that this firm has up to now paid no less a sum than $5,000,000 in royalties to the German government. In addition to the output from the mines in 1895, a good deal of amber was picked up on the beach at Pillau, in the province of East Prussia, being washed up with the seaweed during the prevalence of northwesterly gales. The shore at Pillau after a storm is sometimes covered with a layer of seaweed three feet thick, among which the amber is found entangled. Men, women and children find easy and lucrative employment in searching for the amber along this part of the amber coast. The people engaged in this precarious work often earn thirty shillings a day and more. In 1895 about 100 tons of raw amber came to Dantzig to be worked up, as compared with 140 tons in 1894. It was nearly all melted to make lac and varnish. The larger pieces are made into beads, which are sent all over the world. The beads known to the trade as Leghorn corals were in strong demand.

Street Cleaning in Berlin.

The street cleaning department of Berlin, Germany, is managed by a committee consisting of four city councilors and eight aldermen. The commissioner or "director" receives a salary of a little over $2,000. The next employé is called the inspector and receives 3,000 marks (about $750). Then there are six overseers and an administrator, with salaries from 2,100 to 2,850 marks, and twenty-four chiefs, with 1,500 to 2,000 marks a year. Eight hundred and ninety-seven workmen are regularly employed. Of these, ninety-six are foremen, receiving 3·75 marks (not quite a dollar) a day; five hundred and fifty-one workmen of the first class, with 3·25 marks a day; seventy second class workmen, with 2·75 marks a day, and one hundred and eighty boys at 1·60 marks a day. They are, however, paid for Sundays and holidays, also during sickness, and receive a pension in old age.—Oesterreichische Monatsschrift für den öffentlichen Baudienst.

A RAILROAD MISSION CAR.

We present an engraving of a singular railroad car. It is used for mission purposes in Siberia. The country is sparsely settled, so that the number of established churches is very small, and the car offers a very good solution of the problem of religous instruction and worship. It is transferred from station to station and services according to the Greek ritual are held in it. The interior is very handsome, being decorated with all the rich barbarity and splendor of Russian art. The walls are covered with painted images and are provided with a tabernacle, large candlesticks, etc. Access to the interior of this rolling church is gained in the usual manner. At one end of the car is a chime of bells and the top is surrounded by Greek crosses. Mission cars have been used in the United States, especially in North Dakota, where the same conditions obtain as in Siberia. They contain an organ, an altar, a font, and seats for quite a congregation.



RUSSIAN MISSION CAR.

A Night in a Metropolitan Newspaper Office.*

There are three distinct grades of men in every newspaper office, the men who write, the men who edit, and the men who neither write nor edit, but who direct. At the head of every metropolitan newspaper is the editor. He directs the policy, and final responsibility rests on him for everything that appears in the paper. He has under him the managing editor, who is the chief executive officer of the establishment. This man has supervision of the collection of the news and the manner in which it is prepared for publication. He has a city editor to collect the local news and frequently another man to look after the telegraphic news. The city editor has a corps of reporters under his charge and the chief telegraphic news editor has a corps of correspondents in the various cities of importance in the country under his charge. Only a few papers, however, have a man in direct charge of the telegraphic news. The afternoon is spent regularly in the office in sending out reporters on the customary news assignments of the day, in reading articles submitted for the Sunday newspaper, in writing editorial articles, in looking over the mail, in culling from the exchanges material for reprint. This requires a large force, but the work is subdivided so that there is no rush.

At six o'clock in the evening a new force of men arrives in the office. They are the editors of copy. The composing room begins work at seven o'clock and the editors at once begin to prepare the copy that has been written in the office during the afternoon or the telegraphic news copy that has been sent to the morning papers as well as to those of the afternoon. The managing editor goes home for three or four hours and the office falls at once into a routine.

The night city editor is now in charge of the collection of local news and the editing of copy in his department. He has five or six copy editors to assist him. As fast as an article is prepared it is handed to him and he checks it off on his assignment sheet and either prepares the article for the printer himself or gives it over to one of his assistants. What is called "department matter" is usually the first copy to be handled. This consists of the reports from the courts, from the city hall, the coroner's office, and the like. Reporters continue to come in from time to time to announce the result of the investigations to which they have been assigned during the afternoon. Two reporters are kept in reserve in the office every evening. The night city editor has a most responsible place. He must be a man of keen judgment. He has little time for deliberation. When the news comes of some accident, some defalcation, some murder, the sudden death of some prominent man, he must not only judge instantly what is to be done, but must know where to send to get the fullest information.

The telegraphic news editors in the office of which I write especially number three men, and their work is divided geographically. But in most offices one man is in charge of the telegraphic news, and he parcels out the copy. It is a fact that every newspaper receives every night from two to five times the amount of matter it can print. Very little of it is written smoothly. Rarely is an article sent to the composing room without change. The large staff of editors is necessary to cull out what is printable, to avoid libelous matter, to write the head lines, to condense, to verify statements. As fast as each article is edited it goes to the composing room, and in the course of half an hour on an average a proof is ready for examination. About eight o'clock in the evening a new face appears in the office. It is that of the night editor. His business is to go over the work of the editors on proof, to catch all their errors, and to place every article in its proper place in the paper. He usually answers the telegraphic news queries and then goes over the editorial articles first with great care. He then reads such proofs of the news as have been made. One of his first duties is to get an estimate of the space needed for the advertisements and then to get an idea as to the space each of the most important articles under consideration requires. By a little figuring he can tell whether the paper will be unduly crowded and he allots to each department the amount of space it can reasonably expect. There is no sense in putting a lot of matter in type that can never find a place in the paper. About ten o'clock the managing editor comes in again. He spends the evening in reading proofs for errors in judgment, in answering his correspondence, in settling matters of policy which are referred to him for final decision, and in preparing days ahead for news events which are of importance and the exact time of whose occurrence is known.

About twelve o'clock it is noticed that the night editor is unusually busy. It is time for him to send some of his pages to the stereotyper. He sees that the editorial articles are placed properly according to the editor's schedule, fills up the chinks with such material as harmonizes with the page, and sends it off. The pages with the markets are next prepared and then there comes a lull. The proofs keep accumulating, however, and if any man has an excuse to get feverish it is the night editor. At one o'clock he must send more pages away, according to a careful time schedule. He must supervise the placing of every article in its proper place and page, keeping kindred matters together and skimming with the eye of a hawk through his proofs, which fairly rain down on him. He is the one man who is supposed never to make any mistakes and who must invariably catch the mistakes of others. He must make changes frequently, using his best news instincts instantly and without deliberation. He usually keeps back three pages to the last. One of his last duties is to decide what to leave out for lack of room. It is at times of emergency that the greatest strain comes on the night editor.

In the telegraphic news possibly a presidential convention or a general election causes the greatest strain. At conventions expert writers from the office are sent out, men who know the peculiarities of the office. They must file their matter in the telegraph office page by page, as it is written, and must give instructions on each page as to the proper place it is to occupy in the story. The telegraph offices have a way of dividing every long article filed with them into sections, known as "Letter A," "Letter B," and so on. The editor in the home office frequently gets "Letter G" before "Letter C" has begun, and it takes a cool brain and a steady hand to eliminate objectionable matter, keep the words in their proper order, and maintain a steady rate in sending the matter to the composing room. Election night brings duties such as come only on those occasions. Ordinary routine is practically suspended. On ordinary occasions, however, there is no more confusion, no more nervous excitement, no more feverish haste in a metropolitan newspaper office than there is in the daily conduct of a railroad plant.

* Franklin Matthews, in the Chautauquan. Condensed for Public Opinion, from which paper we copy.—ED.

Why do the Lost Walk in Circles?

The question is often asked, Why is it that a person who is lost, whether it be in a dense wood or on a prairie, invariably moves in a circle, and always to the right? No satisfactory answer has ever been given for this well-known peculiarity under the circumstances mentioned.

Some physiologists, anatomists, and speculative philosophers claim that the left leg in the human species is slightly longer than the right, and so takes longer steps, thus causing a motion to the right which in time completes a circle, if the mind is so bewildered that it has no fixed objective point in view. Perhaps the real answer to this queer question lies in the fact that most persons use their right hands in preference to the left, and are accustomed to passing objects on their right-hand side, and so, unconsciously, keep edging off to the right. On a prairie, however, where there is nothing in the way of obstacles worthy of mention, this cause or reason for walking in a "right-handed" circle would hardly hold good.

Does any reader know, adds the Saint Louis Republic, whether it is a fact or not that left-handed persons who are lost make the circle in an opposite direction to that made by a right-handed person?

Old Ships.

Some old wooden ships are still serviceable. The British Mercantile Shipping List contains one ship 122 years old; three between 105 and 110 years; four between 100 and 105; thirteen from 95 to 100; and fourteen from 90 to 95.

Science Notes.

The Berliner Tageblatt estimates the deficit on the exhibition to amount to something like $1,950,000, and this in spite of the fact that, according to the Lokal Anzeiger, the exhibition, before it closed on Nov. 15, was visited by 3,500,000 paying visitors.

According to the recent communication made to the Royal Society of New South Wales by Prof. Liversidge on the composition of sea water, the professor finds that it contains about 0·5 to 0·8 grain of gold per ton, thus confirming the work of Sonstadt, published some years ago.

German explorers in New Guinea, Dr. Lauterbach, Dr. Keruting, and Herr Tappenbeck, discovered in October, at the foot of the Bismarck Mountain, a navigable stream flowing through a fruitful and thickly populated plain, over which they traveled for two hundred miles. This is the first well populated area that has been discovered in the interior of New Guinea.

Prof. W. J. Waggener finds that with an ordinary printing press and woodcuts or similar relief engravings all kinds of pictures and diagrams may be printed upon sheets of transparent gelatin, in the same way that they are now impressed upon paper. The prints thus made are ready for use as lantern slides without any further preparation, and can be produced for a few cents.

In the polar regions, Mr. Moss found that at a temperature of —35° C. (—31° Fah.) a candle would not burn regularly; for the wax would not melt, being cooled at once by the surrounding air. The flame then burned feebly, and sank down into a kind of tubular hollow; and on boring holes into this the flame sank down so as to leave a tubular shell, which was actually not melted by the flame. The continuous current of very cold air induced by the flame was not heated sufficiently to enable it to melt the wax above the flame.

When a soil that is not irrigated is covered with plants, it evaporates, according to Prof. Wollney, a far greater quantity of moisture than when the surface is bare. In the former case the evaporation cannot exceed the quantity received by the soil from the atmosphere before or during the period of growth. Swampy lands and those that are well irrigated, as also free surfaces of water, can, under circumstances favorable to evaporation, sometimes give to the atmosphere a greater quantity of water than corresponds to the precipitation that occurs during the same time.

An important source of vanadium compounds has lately been discovered in South America, says Nature. In the high plateaus of the Andes, at a height of about 16,000 feet, there exists a mine of anthracite containing vanadium. The coal from this mine, which is easily worked, burns easily, leaving about two per cent of ash. This ash contains one-seventh to one-quarter of its weight of vanadium, besides some silver, with traces of zirconium and platinum. The extraction of the vanadium on the large scale has been accomplished by M. K. Helouis, who has applied it to the preparation of aniline black, to the coloring of porcelain, and in metallurgy. The vanadium used by M. Moissan in the preparation of vanadium carbide came from this source.

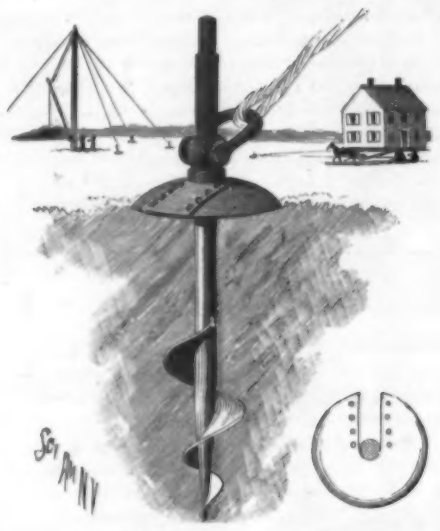
The following table, showing the proportion of light reflected from various substances as compared with that which falls upon their surfaces, is given by Dr. Sumpner, and will be found of interest, says Popular Science News:

	Per cent.
White blotting paper	88
White cartridge paper	80
White tracing cloth	35
White tracing paper	22
Ordinary foolscap	70
Newspapers	50 to 70
Yellow wall paper	40
Blue paper	25
Dark brown paper	13
Dark chocolate paper	4
Planed deal, clean	40 to 50
Planed deal, dirty	20
Yellow painted wall, dirty	20

By common agreement the wasp is accepted as emblematical of irritability and petty malignity; but even this much abused hymenopterous insect plays a beneficial part in the work of nature, as a note in the Irish Naturalist testifies. A number of wasps were seen by Mr. R. M. Barrington, of Bray, buzzing about his cows. Closer inspection revealed that they were all busy catching flies, and pouncing with the rapidity of hawks after birds on the flies as they tried to settle or rest on some favorite part of the cow. One white cow drew more wasps than any of the others, because the moment a fly alighted it was seen at once against the skin. When a wasp catches a fly it immediately bites off both wings, sometimes a leg or two, and occasionally the head. Mr. Barrington saw some of the wasps when laden with one fly catch another, without letting go the first, and then fly away with both. There was a constant stream of wasps carrying away flies, probably to feed the larvæ in their nests, and returning again to the cows to catch more. In about twenty minutes Mr. Barrington estimated that between 300 and 400 flies were caught on two cows lying close to where he stood. Perhaps this narrative of good deeds accomplished will lead people to think more leniently of the vices of the wasp.

AN EFFICIENT ANCHOR.

For anchoring vessels to the shore of a stream, or for fastening guy lines in raising derricks or in house moving, the simple form of anchor shown in the accompanying illustration has been devised and patented by John J. Ryan, of No. 120 Front Street, Memphis, Tenn. The anchor post has a tapered lower end provided with a screw blade, its upper end receiving a wrench by which the post is turned into the ground, and there being an aperture in the post through which may be passed a bolt to secure a line shackle in position. Movable vertically on the post between the screw blade and a collar just below the shackle is a metal anchor disk, shown also in the small view, the slot in the disk being closed by a riveted plate when the disk has been placed

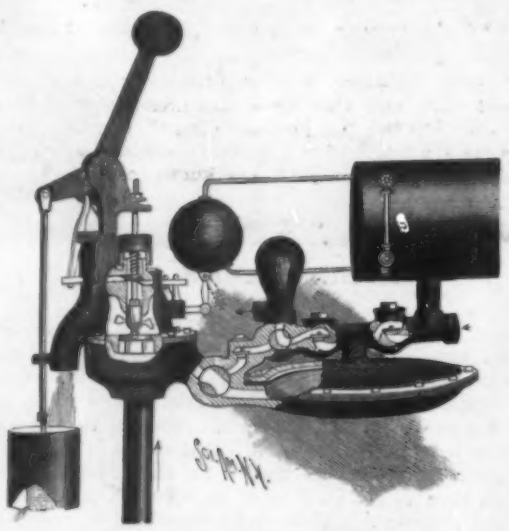


RYAN'S SHORE ANCHOR.

in position on the post. This disk is designed to be especially advantageous in making an anchorage in soft or sandy soils, or in banks over which water is flowing, and also serves as a guide to hold the post straight while screwing it into the ground.

AN IMPROVED HYDRAULIC ENGINE.

The illustration represents an improvement in hydraulic engines whereby the action of a ram or momentum valve is rendered automatic, and the momentum of water is utilized to handle other fluids or gases, as in a pump. The improvement has been patented by Horace D. Payne, of Thompson, Pa. Combined with a ram valve of peculiar construction having a water supply is an incased diaphragm or piston, the space beneath which has connection with the water supply, while the space above is adapted to receive and handle a fluid or gas separate from the water supply. The diaphragm thus has a fluid on each side, or a liquid on one side and a gas on the other side, the pressure being nearly equalized in either case and insuring durability in the diaphragm. The valve is adapted to be seated in the casing by the water pressure, and a bolt movable transversly in the casing is adapted to engage the valve stem to hold the valve open, a pivoted lever connected with an overflow vessel moving the bolt out of engagement with the valve stem, while a water receiver has connection with a bolt adapted to hold the valve in closed position. A weighted lever pivoted to a bracket on the valve casing is adapted to move a pivoted lever connected to a bolt adapted to hold the valve open, and a vessel connected to the weighted lever is adapted to receive water discharged from the valve casing. As shown in the engraving, the device is arranged as a combined boiler feeder and pump for conducting the water from steam coils or radiators of a heating system situated below the water level of the boiler.



PAYNE'S HYDRAULIC ENGINE.

Facts About False Hair.

History (writes Mr. Eric Broad, in Hearth and Home) records the fact that in 1662, in this country, long flaxen hair was purchased, from the head, at ten shillings an ounce, while other fine hair fetched from five to seven shillings for the same quantity; and within the present century the heads of whole families in Devonshire were let out by the year at so much per poll, "a periwig maker of Exeter going round at certain periods to cut the locks, afterward oiling the skull of each bereft person." That the use of false hair as an aid to feminine beauty was not unknown to the ancients is well proved. The Greeks, Romans, and Egyptians, long before the dawn of the Christian era, resorted to the wearing of tresses obtained from other persons' heads; they even went so far as to paint bald heads so as to represent them as covered with short hair, also marble caps, so painted, were worn. A valuable merchandise in the blond hair of German women is mentioned in ancient Roman history.

A question that has doubtless often presented itself is: Where did all this hair come from? This question I will endeavor to answer. With the coming of spring, in the midlands and west of France, appeared what may fitly be termed a singular class of nomadic individuals, armed with long, iron-tipped staves, and bearing heavy packs of merchandise upon their backs. At first glance one would have taken them to be ordinary hawkers; yet merchandise was but an accessory to their strange industry. They were the coupeurs, the reapers of a hirsute harvest. Armed with long, keen shears, they went their way seeking the tresses of willing victims dwelling in outlying hamlets and villages of peasant France; and a laborious business it was. From "dewy morn" until the shadows of night gathered thickly, they did their ten or fifteen miles a day—often fruitlessly and with empty stomachs, their only bed the wayside. In Auvergne these seekers after hair were known as chimneurs. The Bretons called them margoulins, which terms have no fit English parallels. These curious journeymen exerted every effort to gain their ends—a good head of hair; the former preferring the local fairs as a workroom, the latter choosing to visit the dwellings of their possible clients. In summer the Brittany margoulin was often seen going through the streets, carrying his long staff, from which hung twists of hair, while he cried in doleful tones the well known "Piau! Piau!" at the sound of which the cottagers, with an itching desire to possess some of his gewgaws, attracted the wanderer's attention. He was only too pleased to dazzle their eyes with his many colored wares, and the bargaining was not slow to begin. While the woman fingered his goods, the margoulin weighed her tresses with his hand—a proceeding at which he was adept through long practice. The bargain ended, the woman yielded her abundant locks in return for a few yards of cotton stuff, or a gay petticoat, to which—thanks to the progress of civilization—the coupeur had to add a small sum of money. Sometimes the transaction was not completed without much discussion on both sides. Very often the coupeur had to return to the charge owing to female indecision; and he was more than happy when sure that a tardy remorse would not rob him of half his coveted trophy.

Until the authorities intervened cutting was conducted in public as an amusement for onlookers, it being considered highly entertaining to hear ten or twelve rival coupeurs eulogizing their wares, each protesting his to be far superior to his fellows. The prohibition of this custom drove the hair harvesters to erect tents, rent for the day unoccupied shops, cellars, stables, or any corner they could find wherein to establish themselves. Sticks were then stuck up, from them being suspended petticoats as a lure, as an indication of what could be had in exchange for tresses; to the petticoats were attached twists of hair as trade marks. The ruse succeeded, peasants halted, casting envious glances at the multi-colored garments; they were handled, and even tried on, thus affording an opportunity to the coupeurs to flatter their fair customers—who did not long rest—and victory rewarded the cute buyers. In Auvergne—where the coupers were most numerous—the greatest harvest was reaped on St. John's day. The ingathering extended from April to September, during which month the butchers, bakers, locksmiths, etc., forsook their ordinary avocations for that of the coupeur, returning to their legitimate trades with the coming of the dead season. The hair of different countries was distinguished by certain qualities; for instance, that of Auvergne was the coarsest; the finest and the most flaxen came from Belgium; the blackest and longest from Italy; while that procured in Brittany was the most beautiful, though least well cared for.

IT is announced that our neighbors, Foster, Paul & Co., 364 Broadway, manufacturers of kid gloves, are to retire from business on January 1. This firm was established some twenty years ago, adopting a patented fastening for gloves, and to this invention is attributed their great success as manufacturers and the fortune the concern has acquired.

Natural History Notes.

The Fountain Tree.—Mr. Henri Lecomte, who has recently returned from a mission to Congo, gives some curious details concerning a fountain tree that he met with in his travels. This tree, which is very lofty and grows in damp places, is called the "moosanga." It belongs to the order Urticaceæ. The trunk is very regular and is provided with large branches that bear finely dissected leaves. It is divided at the base, like that of the mangroves, and enters the earth through a large number of ramifications. When the tree is cut at a height of about five feet, says the Chronique Industrielle, a large quantity of water is observed to flow from the section. Mr. Lecomte cut one at a height of five feet from the ground that had a diameter of twenty inches, and then, forming a gutter along the trunk, placed a pail at the base. The next morning the pail, which held nine quarts, had overflowed. The water continues to flow after the trunk has been cut for some time. It doubtless ascends the trunk through capillarity. It seems to be perfectly potable, although rich in chlorides and other salts.

The Roentgen Rays in Botany.—The result of some experiments recently communicated to the German Botanical Society, by Mr. Alfred Schober, seems to show that the X rays exert scarcely any influence upon the phenomena of plant life. Plants exposed to the action of the light of the Hittorf tube showed, however, that this differs from solar light, as far as plants are concerned, in that it does not cause any heliotropic incurvation. It is well to add, nevertheless, that the conclusion is perhaps immature, seeing that the time of exposure of the plants to the rays was quite short (thirty minutes) and not sufficient to justify the assertion made by the experimenter.

Vegetation and Civilization.—Mr. Thomas Kirk, in a memoir recently published by the Philosophical Society of Wellington, New Zealand, gives a certain number of interesting facts relative to the modifications that the indigenous flora has undergone. These modifications are due to the direct or indirect action of man, voluntary or involuntary. Thus, at the present time there are five hundred new species that have been more or less completely acclimated in this country, where they had never existed before. In certain regions such species have obtained such a firm footing that they might readily be thought to be indigenous, if their true history were not known. The indigenous flora has receded before these strangers; and it must not be thought either that it is large plants that are driving the old flora out, for in most cases it is small species which, through numerous and varied mechanisms that it would be interesting to explain in detail, gradually succeed in eliminating plants that at first sight seem to be vigorous and well adapted for a successful struggle for existence.

Census of the Animal Kingdom.—The editors of the Zoological Record have recently drawn up a table that indicates approximately the number of the living species of animals. The following are the figures given: Mammals, 2,500; reptiles and batrachians, 4,400; tunicata, 900; brachiopods, 150; crustaceans, 20,000; myriapods, 3,000; echinoderms, 3,000; cœlenterata, 2,000; protozoans, 6,100; birds, 12,500; fishes, 12,000; mollusks, 50,000; bryozoans, 1,800; arachnids, 10,000; insects, 230,000; vermes, 6,150; sponges, 1,500. General total, 366,000 distinct species.

Fear in Animals.—A Scandinavian writer cited by the Zoologist has recently described a curious method of capturing swans much employed for centuries past in the northwest of Iceland. The swans, after moulting in autumn, leave the interior in order to reach the coast. The inhabitants of the coast and their dogs are prepared, and, when the birds approach, begin to make as much noise as they can by shouting, striking boards with stones, and making as much of a racket as possible. This noise has a powerful effect upon the young swans, which, terrified and distracted, and not knowing which way to turn their heads, allow themselves to fall to the ground, where they are seized without any difficulty. Fear is likewise exploited in South America for the capture of another species of swan by the Gauchos, who, when they perceive a flock, run toward it in keeping themselves leeward to the wind and in concealing themselves. When they get close enough to the flock, they spur up their horses and rush upon the birds with loud shouts. The swans, seized with fear, are unable to take flight, and allow themselves to be seized and slaughtered upon the spot. The paralysis of fear is met with also in other animals, and in a most marked manner. Mr. Cancani has pointed out quite a large number of instances in which animals have given manifest signs of fear or inquietude before earthquake shocks. We need not look for a peculiar form of presentiment in these animals, for they are in all probability influenced by the very slight tremors that precede the heavy shocks. However, as Mr. Cancani remarks, such inquietude of animals is observed only in cases in which the center whence the shock emanates is quite distant, and he supposes that the slight vibrations travel more quickly than the strong ones, but that it requires a distance great enough to allow the differences to be appreciable, in order that the vibrations may arrive sufficiently in advance of the shocks and affect the animals before the shocks occur.

Animals and Steam.—A writer in a German engineering journal contrasts the behavior of different animals toward steam machinery. That proverbially stupid animal the ox stands composedly on the rails without having any idea of the danger that threatens him; dogs run among the wheels of a departing railway train without suffering any injury, and birds seem to have a peculiar delight in the steam engine. Larks often build their nests and rear their young under the switches of a railway over which heavy trains are constantly rolling, and swallows make their homes in engine houses. A pair of swallows has reared its young for years in a mill where a noisy 300 horse power engine is working day and night, and another pair has built a nest in the paddle box of a steamer that plies between Pesth and Semlin.

The Speed of Birds.—The speed of pigeons and of birds in general has been much discussed in recent times by different zoologists. Many authors are inclined to give too high figures. Thus, according to Spallanzani the speed of the martin is fixed at 290 feet per second, and that of the pigeon (estimated from a flight of four from Paris to Budapest) at 155 feet per second. But these figures appear to be erroneous. An interesting experiment, reported by Ciel et Terre, has just been made at Anvers by Mr. A. Verschuren on the subject of the speed of swallows. Having succeeded in capturing one of these birds, he marked it and gave it in charge of a train that started for Compiegne on the 16th of May with 250 baskets of carrier pigeons belonging to the Federation Colombophile. The swallow was set free on the 17th of May at 7 o'clock in the morning along with the pigeons, and, quick as a flash, took a northerly direction, while the pigeons were still describing numerous spirals in search of their direction. At twenty-three minutes past eight the bird made its appearance in Anvers and hastened to seek its nest. The first pigeons did not enter their cote till half past eleven. The swallow had made the 140 mile trip in one hour and eight minutes, say at a speed of 120 miles a hour or about 190 feet a second. The pigeon attained a speed of but 35 miles an hour or 50 feet a second. Such speed, nearly 200 feet a second, gives us an idea of the rapidity with which swallows are capable of accomplishing their migrations. To reach Belgium from the north of Africa, for example, it would take them scarcely half a day.

The Leechee.—The leechee, or as it is variously spelled, litchi, lichi, or la'tji, is the most celebrated of the indigenous fruits of China, and is now frequently imported to this country and sold in fruit stores, and is sometimes presented by Chinese laundrymen to their customers. There are several varieties, but the most common is nearly round, about an inch and a half in diameter, with a thin, brittle shell of a red color, covered all over with rough, wartlike protuberances. Others are larger and heart-shaped. When fresh they are filled with a white, almost transparent, sweet, jelly-like pulp surrounding a large shining brown seed. After they have been gathered some time, the pulp shrivels and turns black, and then bears some resemblance to a prune. The Chinese are very fond of these fruits and consume large quantities of them both in a fresh state and when dried and preserved in various ways. The tree that produces them (Nephelium litchi) grows to a height of about twenty feet, and is a native of Southern China, although known only in a cultivated state.

The New Mint Building.

The plans for the new United States Mint, to be built in Philadelphia, at Sixteenth and Spring Garden Streets, have been completed and approved, and advertisements for bids for the erection will be promptly issued, says the American Manufacturer. The act authorizing the building fixes the cost at $2,000,000. The site cost $325,000. The plans purpose a building to cost $1,650,000. It will occupy the entire square bounded by Spring Garden, Sixteenth, Buttonwood and Seventeenth Streets. The main front is on Spring Garden Street and the side entrance for workmen and wagons on Sixteenth.

The building is arranged in the form of a hollow square with an interior courtyard. The front of the building proper on Spring Garden Street is 316 feet, while the terrace which runs the entire length of the lot is 396 feet. The building has frontages on Sixteenth and Seventeenth Streets of 180 feet. The rear of the building on Buttonwood Street comes directly on the street. The architecture is of the classic style, with some ornamentation of cornice, etc. The interior arrangement is designed in the most careful manner to secure the best possible practical operation of the mint.

The Abuse of Free Libraries.

At its recent annual meeting in Cleveland, the American Library Association heard some candid criticism from its president, Mr. John Cotton Dana, librarian of the Public Library of Denver. He feared that his enthusiasm for the free public library was born more of contagion than of conviction. In the public library, he said, you have stored a few thousand volumes, including, of course, the best books of all time—which no one reads—and a generous percentage of fiction of the cheaper sort. To this place come in good proportion the idle and the lazy, and also the people who cannot endure the burden of a thought, and who fancy they are improving their minds, while in fact they are simply letting the cool water of knowledge trickle through the sieve of an idle curiosity. The more persistent visitors are largely men who have either failed in a career, or never had a career, or do not wish a career.

Mr. Dana charged the free public library with relieving the idle, the incompetent, and the indifferent reader from the necessity—would he have books—of going to work to earn them. It checks, he continued, the serious reader in collecting a library of his own adapted to the wants and tastes of himself and his family. It leads parents to regard with indifference the general reading of their children, just as the free public school may lead them to be indifferent to their formal education.

This and much more in the same strain was loudly applauded by Mr. Dana's large and representative audience of librarians. It is evident that the abuses of free public libraries have led to much searching of heart among their chief officers. They are feeling, as the teachers of the public schools also feel, that they cannot take the place of the parent who abdicates from one of the primary responsibilities of parenthood. A child whose father and mother hand over its mental and moral culture to the teacher and the librarian virtually becomes an orphan. Neither public school nor public library can do its duty toward its pupils and readers without the hearty and intelligent cooperation of parents. Mr. Dana's address was clearly intended to traverse the easy optimism and self-gratulatory vein usual in presidential utterances. His criticisms will bear fruit in pointing to the abuses and losses inevitable when the form of gratuity is impressed upon a comfort or a luxury which each should buy for himself. The form of gratuity is a form only; at great and increasing cost a service is proffered which should be rendered, not in the free public library, but in the home; or, if a compromise must be made, then by the free public library watchfully directed from the home. —Appleton's Popular Science Monthly.

Dr. Salmon on Tuberculosis.

In the course of an address given in New York City, Dr. D. E. Salmon, chief of the National Bureau of Animal Industry, made the following brief summary upon Tuberculosis, says the Massachusetts Plowman. We have learned, said Dr. Salmon, that:

1. Tuberculosis is a germ disease.
2. The germ attacks a great number of animals; e. g., men, cattle, fowls, swine, sheep, cats, dogs, horses, rats, mice, domestic vermin. Even bedbugs have been known to communicate the disease. Each infected animal throws off germs capable of infecting the others.
3. The germ attacks only diseased or abraded tissue.
4. There are cells within the body whose duty it is to fight disease germs.
5. The germ may enter either by inhalation, inoculation or ingestion.
6. Tuberculosis is more prevalent in old than in young cattle.
7. Tuberculosis is not hereditary.
8. The germ can be killed: a, by a temperature of 158 degrees Farenheit for thirty minutes; b, by direct sunlight; c, by diffused sunlight.
9. Its virulence depends on the numbers present.
10. In-breeding, poor health, poor ventilation, poor food, lack of sunlight, are important predisposing causes.
11. There is no more, if as much, tuberculosis at the present time than in the past.
12. Tuberculin, in competent hands, is a trustworthy and safe diagnostic agent.
13. Tuberculosis is not a respecter of breeds.
14. That communities have been furnished almost entirely with milk from tuberculous herds, without any appreciable increase in tuberculosis. Others have been furnished milk from healthy herds with no appreciable decrease in tuberculosis.
15. That where fat calves have been inspected, even where a large proportion of their dams and nurses are tuberculous, only in from two to five in 100,000 has the disease been detected.

One conclusion drawn by Dr. Salmon is to the effect that tuberculosis is not hereditary, and he thinks the disease could be bred out of a herd by separating the infected animals and raising the healthy calves according to the Danish method recently described in this paper.

THE VICTORY OF SHOT OVER ARMOR.

We present in this issue an excellent half-tone engraving of what may justly be called the most successful penetration of Harveyized armor plate on record, which was made by a Johnson solid shot at the naval proving ground, September 5. The penetration of 10 inches of nickel steel, face hardened, reforged plate by a 6 inch shot, as shown at the point marked No. 3 in the engraving, is in itself a phenomenal performance, and places the gun once more far in the lead. But when our readers learn that, after penetrating the plate, the shot passed through 12 inches of oak and three plates $\frac{1}{16}$ inch thick, and was finally found 8 feet back in the sand and practically uninjured, they will understand how complete is the superiority of the best type of shot over the best type of armor to-day.

It is a matter of history that, just at the time when armor plate makers were discouraged by the ease with which the gun makers were able to penetrate the toughest nickel steel, Mr. Harvey produced his brilliant invention for giving an intensely hard face to the plate, and succeeded in smashing up the projectiles at the moment of impact. Shots which theoretically should have passed clear through a Harveyized plate failed to do so, because their points could not hold together long enough to break in through the highly tempered face, which was made so hard that it could cut glass like a diamond point.

Subsequent to the appearance of Harveyized armor the makers of projectiles have been trying to produce a shot which should combine the necessary hardness and toughness to enable it to split open the hardened face and hold together until it had wedged its way through the body of the plate itself. A few of the best makers have met with partial success. The Holtzer in Europe and the Sterling-Wheeler in this country have succeeded in breaking up the face; but the effort has proved too much for the shell, which has usually collapsed before it could get entirely through the plate. This has been the case almost invariably when the improved reforged Harvey plate has been attacked. The result is shown very clearly in the case of shot No. 1 in the recent trials, when an 8 inch Holtzer shot, weighing 250 pounds, and fired with a velocity of 1,800 feet a second, entered the plate and broke up, leaving the point embedded.

For many months the reforged Haveyized plate held its superiority, and it looked as though the final victory in the long contest between shot and armor was to rest with the armor. The next move on the part of the artillerist was of a very extraordinary, but very successful kind. He placed a cap of soft steel over the point of the shot to protect it, and, paradoxical as it may appear, the soft cap enabled the shot to get through.

The part played by the cap may best be explained by a simple experiment which can easily be tried by any of our readers. An ordinary sewing needle may be driven through a copper cent piece by thrusting it through a cork until the point is flush with the bottom of the cork, placing it upon the copper cent, preferably over an anvil, and giving the head of the needle a sharp tap with a light hammer. The copper will be cleanly perforated. The surrounding cork holds the body of the needle in the line of the blow, so that its whole force is concentrated at the point. The action of the cap is somewhat analogous. It preserves the integrity of the point of the shot at the moment of impact, holding the material together until penetration through the hard face is effected. Moreover, the cap becomes fused by the heat of concussion and lubricates the point as it enters. After the face is broken through, the Johnson shot holds together by virtue of its peculiarly hard and tough composition, which is obtained by a secret process of manufacture.

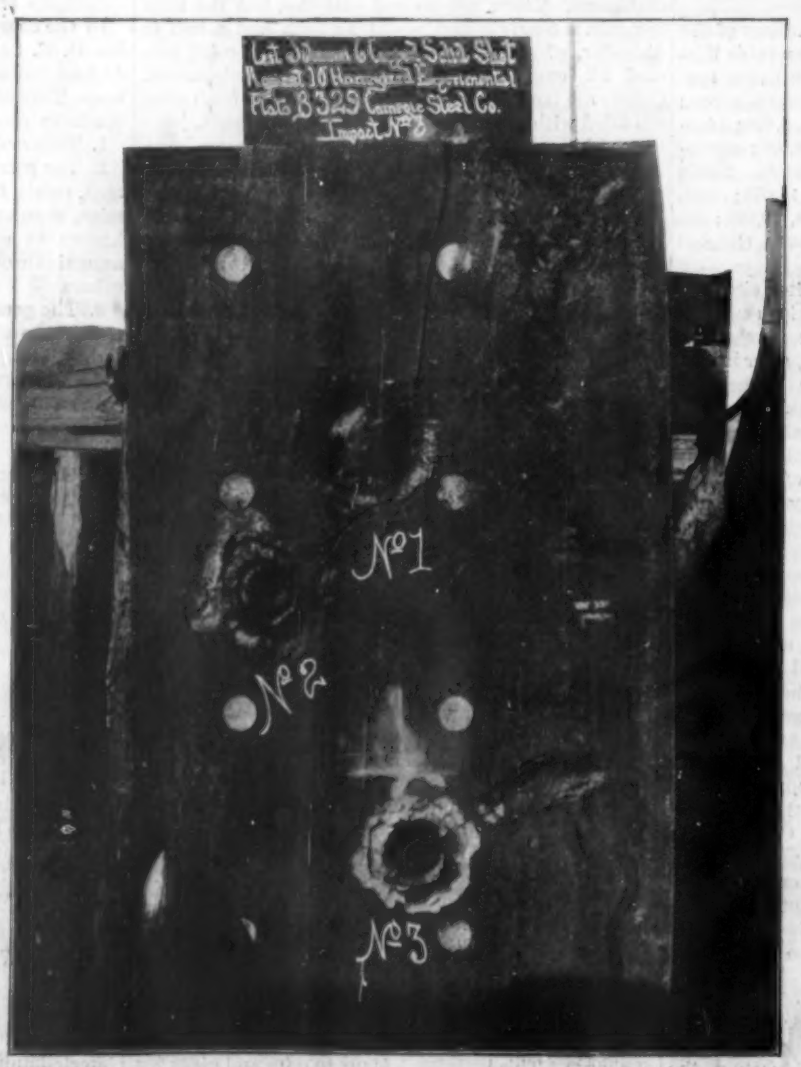
Referring again to the photograph of the plate, shot No. 2 represents a 6 inch 100 pound Johnson shot which was fired with brown powder at a velocity of 2,100 feet per second. It penetrated to a depth of 8 inches and communicated all of its theoretical capacity at that velocity, the rear portion of the shot breaking off and rebounding from the target. Mr. Johnson was confident that if the shot were given greater velocity, it would make a clean penetration, and accordingly a charge of 28 pounds of torpedo station smokeless powder was inserted for the next round. The shot, weighing 105·25 pounds, struck the target with a velocity of 2,505 foot seconds and an energy of 4594·8 foot tons at a point 21·5 inches normally from the bottom, and 32 inches from the left edge of the plate. The work of the shot, which passed through the plate practically uninjured, can best be given in the words of the official report:

Action of Projectile.—Projectile penetrated plate, backing, boiler plates, and was recovered 8 feet back in the sand, entire, with the exception of one-half of base broken off diagonally to the bandscore. The remaining portion of the shell was in excellent condition, with the point whole, the head slightly scored, increased in diameter at the bourrelet 0·15 inch and in body 0·06 inch; length decreased 0·49 inch. Two small surface longitudinal cracks in the body 5·5 inches and 2 inches long, also two in the head 1·5 inch and 2·5 inches long respectively. Four fragments recovered; total weight, 95 pounds; weight of the shell proper, 85 pounds.

Effect on Plate.—Penetration complete; diameter of shot hole, 6¼ inches; interior for about 3·5 inches in rough, with fused metal, rest of hole smooth, all the interior being coated with copper, probably from the rifling band. Diameter of splash and flaking, 13 inches, $\frac{5}{8}$ inch deep. The boiler plate backing was star opened to a diameter of 16 inches.

A 6 INCH JOHNSON SOLID SHOT, SHOWING METHOD OF ATTACHING THE SOFT STEEL CAP.

A 6 INCH JOHNSON SOLID SHOT AFTER COMPLETELY PENETRATING A 10 INCH REFORGED HARVEY PLATE.



PHOTOGRAPH OF 10 INCH REFORGED HARVEY PLATE AND 6 INCH JOHNSON SOLID, CAPPED SHOT, AFTER COMPLETE PENETRATION. STRIKING VELOCITY, 2,502 FOOT-SECONDS. STRIKING ENERGY, 4,594·8 FOOT-TONS.

A comparison of the two cuts showing the projectile before and after firing will show the wonderful endurance of the shot. The deep scorings on the conical head were produced by the jagged edges of the hardened armor face, and the twist imparted by the rifling is plainly discernible. The corrugated recess at the base is the seating for the copper rifling band, which, as the report states, was sheared off in the shot hole, together with diagonal fragments of the base. Altogether this is by far the most brilliant performance of any shot in any country, and the two photographs which are now presented to the public for the first time are well calculated to carry dismay into the camp of the armor plate makers. Messrs. Johnson & Company, of Spuyten Duyvil, New York, are to be congratulated on a success which has come as the result of many years of costly experiment; and the country at large will be pleased to think that, if Harvey's plates have been signally beaten, it is an American projectile that has done it.

Incidentally it should be noted that the success of the second Johnson shot was only achieved by using a high velocity, considerably higher than the 2,000 feet per second which is obtained with the standard brown powder used for United States ordnance. Mr. Johnson is asking for 3,000 feet per second in order to develop the full potentiality of this solid shot; and it must certainly be admitted that the introduction of smokeless powder, with its higher velocities, would be an advance along the lines which are being universally followed by the gun makers of England and the Continent. The 10 inch Brown segmental wire gun now in course of construction by the government will have a maximum velocity with smokeless powder of 3,000 feet per second, and would seem to be the natural counterpart of the Johnson shot. The St. Louis and the St. Paul are designed to carry a battery of 6 inch guns, and if these guns were to be of the wire wound pattern, and the ammunition included smokeless powder and a certain number of rounds of Johnson shot, these cruisers would have three-fourths of the armor plate now afloat at their mercy.

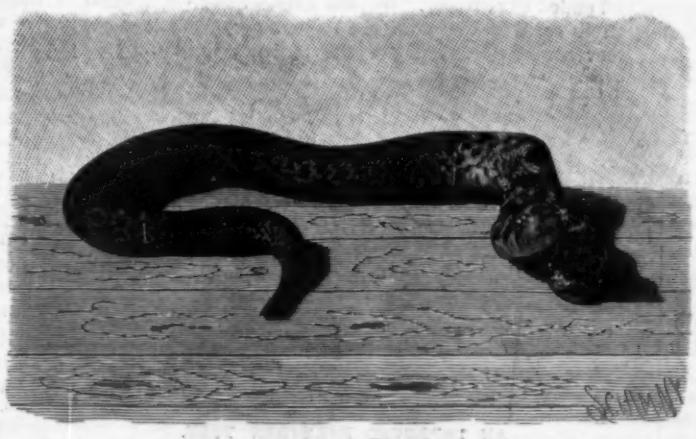
Water Curtains to Protect Sky Scrapers.

Firemen of the future will fight fire by simply draping buildings with water curtains, says the Home Journal. The water curtain is formed by throwing out continuous streams of water from the roof line, and merely allowing it to spread itself out and fall in a sheet. Several striking tests have already been made with this device in Boston. The results proved so satisfactory in every way that the attention of the fire boards and the insurance men has been attracted all over the country. The water curtain is a very inexpensive luxury. But, if it be adopted, fire risks will be reduced to a minimum. Besides, it can do no more damage to adjoining property than an ordinary hard shower of rain. The rapid growth of the modern sky scrapers and the conversion of streets into deep, narrow canyons have greatly increased fire risks. Modern fire apparatus has failed in some measure to keep pace with these changes, in spite of the extension tower, hose, and other devices. The danger has been only partially met by the construction of so-called fireproof buildings. The narrow streets, walled in by towering buildings, so confine the heat that a bad fire converts them into ovens. This drives the firemen out of them, and the next step is for the flame to arch over the street and spread at will. These conditions call for an entirely new departure in fire apparatus. The plan of the water curtain meets just this demand. It is necessary only to provide a source for this curious waterfall at the top of buildings, and let gravitation do the rest. A pipe is run up to the topmost cornice of the roof and connected with the water main. At the end of this hose or pipe a nozzle is so arranged that the water forced up is spread out in a thick spray. This first rises above the building for a few feet, then turns and falls to the ground in an unbroken sheet. The thickness of this curtain can readily be regulated by the size of the opening, while its texture depends upon the form of the nozzle.

PROF. RUCKER has shown that the Roentgen rays may be used to distinguish between various qualities of porcelain, those being more phosphatic being more opaque than those which are less so.

A TWO-HEADED SNAKE.

To most people the Ophidia are surrounded with mystery and horror, and this is little to be wondered at, for there is hardly anything which is more repellent than a snake. The species of this order number nearly one thousand, and all possess remarkable similarities; but the example which we show is a remarkable curiosity and is a true freak of nature. It is said to be a hognosed snake (Heterodon simus) and has two heads each perfect in itself, and apparently each head is endowed with separate will power. It came from Central America and is in the possession of Mr. E. C. Fischer, of New York City. It is a young snake, being only four months old, it is not quite a foot long, but it is said that this variety of snake frequently attains a length of several feet when mature. It is of a brownish green color, which seems to change somewhat at times. The eyes are particularly bright and the snake seems to be endowed with considerable intelligence, as it appears to know Mr. Fischer, and will come over to the side of the box nearest him and the little tongues are protruded as a token of joy. The curious little creature is very lively for a snake kept in captivity, and is preserved in a glass box. The photographer of the SCIENTIFIC AMERICAN spent three hours in trying to photograph it. The snake likes to lie in the sun, but turns its head away from the light. It was laid on flannel on a table in a good light and the camera was pointed at it. The little animal wriggled away. The table was turned around with the same result, and at last an instantaneous photograph was taken of it.



A TWO-HEADED SNAKE.

Both of the heads eat at once, the diet being milk, raw meat, and blood. It is found wise to feed both heads at the same time, for, strange to say, the two heads appear jealous of each other and sometimes fight. At other times the heads play together. The snake has great strength for its size and twists a stick around and can be readily raised by it.

SOME INEXPENSIVE COUNTRY HOUSES.

We publish in the accompanying engravings views of two inexpensive country houses which have been recently erected at Roland Park, near Baltimore, Md. These engravings are prepared from photographs specially taken for the BUILDING EDITION of the SCIENTIFIC AMERICAN, and published in that magazine with full plans and particulars in the May issue of 1896. The house shown in the upper views was designed by the owner, James F. Leib, Esq. The views show a front piazza, with four stone piers to height of rail, forming base for square columns supporting the overhanging gable roof, which is relieved by the wide, hipped-roof dormers in front and rear. Underpinning and piers, of local stone; structure above sheathed, papered, clapboarded, and painted yellow at first story; gable shingled and stained brown; roof also shingled, and left to weather; chimneys of brick, capped with stone. Dimensions: Front, 29 ft., exclusive of entrance porch; side, 40 ft., including piazza. Height: Cellar, 6 ft. 6 in.; first story, 9 ft.; second, 8 ft. 6 in.; attic, 7 ft. The entrance porch at side, with door opening on hall, in white pine, grained oak; staircase has wide newels, with paneled faces and flat cap; turned balusters on straight string; sliding door opening to music room, in pine, painted white, with angle fireplace, faced with light gray mottled tiles; mantel, also painted, has ornamental top and beveled mirror. Library connects by sliding doors; similar fireplace, with tiles of light mottled brown, mantel above, mirror backed. This room also has glazed door to front piazza, and really serves the purpose of reception hall or living room. Dining room has fireplace, also tiled; upper mantel shelf is supported by two long fluted columns; two shorter ones support the side shelves; beveled mirror head. Passage, with pantry at side, leads to kitchen. A wide, circular arch, with large, central electric light globe, forms interesting feature in second floor hall. This floor is divided off into four chambers of good size, two with alcoves (circular plaster arches), and all with large closets; also bathroom, wainscoted in yellow pine, natural; all plumbing being exposed and nickel plated, tub of enameled iron, basin of marble; all best make; two rooms in attic; house is trimmed throughout in white pine, grained or painted, lighted by electricity and gas, heated by hot air, and cost complete $3,500; cellar, cemented, contains heater, fuel storage, etc.

The lower engravings represent the residence of Mrs. H. B. Rosston, built by the Roland Park Company. W. L. Price architect, Philadelphia, Pa. The views show a design appropriate to its surroundings, the broad treatment of roof and gable ends being the principal features of the design. There is a wide, well shaded porch, with square columns on stone piers, supporting the high hipped and overhanging gable roofs. Underpinning, portion of first story, and main chimney of rock faced local stone, laid with joints well broken and with good color effect; other chimneys of brick, stone capped. All exterior framework sheathed, covered with building paper, shingled, and stained deep red; roof similarly treated. Dimensions: Front, 31 ft. 3 in., exclusive of bay; side, 62 ft. 7 in., not including porch projections. Heights: Cellar, 7 ft. 6 in.; first story, 9 ft.; second story, 8 ft. 6 in.; attic, 7 ft. 6 in. The reception hall, running full width of house and finished in red oak, has wide arched opening, forming separating feature from staircase portion. fireplace centred, faced with tiles, mantel over. Wide staircase of easy rise, turned balusters and plain square newel, leaded landing window; walls papered. Parlor also has tiled (angle) fireplace, mantel of neat design above, connects by sliding doors. Dining room, finished natural, has double sliding door opening, bay full width, and connects with kitchen, containing usual fixtures, through pantry, provided with dressers, sink, etc. Laundry in rear has three wash trays. Second floor divided into four chambers, the connecting one intended for dressing room, and bathroom, with plumbing exposed and approved fixtures. Large linen closet provided with shelves, etc. Attic, servants' rooms and storage space. Cellar cemented, provided with heating apparatus, fuel storage space, etc.

SOME INEXPENSIVE COUNTRY HOUSES.

A NEW X RAY TUBE.

In Photography, of recent date, is described a new form of X ray tube said to be peculiarly powerful in producing rays of remarkable penetration, and is designed by W. Watson & Sons, of London.

Many of the weak points which we have always grumbled at in such tubes have been rectified in this. For instance, although it is a little matter, the terminals are made of stout metal, and the electrodes are very widely separated. The internal arrangement of the tube is somewhat different from its predecessors. The cathode is a small one, and the anode consists of a ring mounted in line between the platinum disk, which is insulated from the anode and the cathode. It appears that the whole cathodic stream is concentrated by means of this ring upon the platinum, and the glow which is seen in the tube does not encircle the entire globe, but only the portion which is illuminated by the reflection from the platinum disk. The brilliance that the tube gives on the fluorescent screen is simply remarkable, while, for radiographing, those who have had opportunities of testing it say that the exposure is about half that previously necessary with the focus tube. We have seen a very fine radiograph of a man's heart taken with one of these tubes in fifteen minutes.

Finality has not been reached in tubes yet, but an advance of this description should not go unrecorded. The same manufacturers are also making a very useful rheostat to be used in the circuit between the battery and the induction coil. It is composed of a long coil of platinum wire which offers a great resistance to the current, and control is afforded by means of a connecting arm which rides above the coil of wire and is in contact with it.

A MODEL JOURNAL.

"The SCIENTIFIC AMERICAN is now in its fifty-first year of publication. In celebration of its fiftieth anniversary a special edition of 72 pages was issued reviewing the great inventions of the last half century, and the discoveries that have been made in science since the first number of the magazine was published.

"No expense was spared to make that number in every way worthy of the occasion, and all in all it reflected much credit on every one who took part in its getting out. In text and typography every item was up to date, the former covering about the whole field that has been added to our knowledge during the last fifty years. The number itself, full of half tone illustrations made by one of the labor saving modern inventions, and the price at which it is sold are of themselves impressive testimonials of our advancement in the typographical art. Of all weekly publications of its kind the SCIENTIFIC AMERICAN is certainly at the head of the procession."—The Trade Postal Journal, San Francisco.

Thank you, Mr. Editor, for your kindly notice, and to the more than three thousand of our contemporaries for mentioning in their columns their appreciation of our anniversary number.

And for the further courtesy of our confrères in recommending their readers to become subscribers to the SCIENTIFIC AMERICAN, we add the suggestion that every public library and school in the land should

A NOTABLE COLLECTION OF NEWSPAPERS.

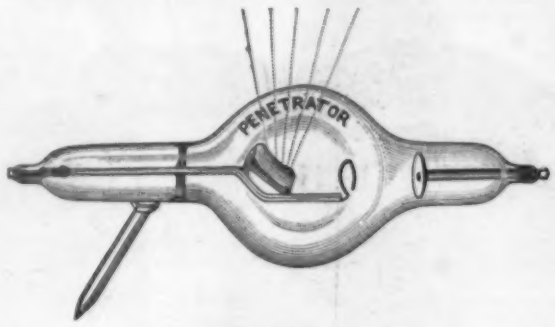
keep the paper on file, for the beneficial influence it exerts on the community.

The above half tone engraving was made from a photograph of the pile of newspapers which came to this office, exclusive of monthly magazines and foreign exchanges, containing notices of the anniversary issue.

THE degree of LL.D. has been conferred by Harvard University on Prof. Alexander Graham Bell.

Kitasato's Work in 1895 in Serotherapy.

Kitasato has collected from reliable sources 26,521 cases of diphtheria in Japan previous to serotherapy, with 14,996 deaths (56 per cent); while of 353 cases treated here from November, 1894, to November 25, 1895, there were only 31 deaths (8·78 per cent). There is reason to believe that the mortality can be lowered if the treatment could be commenced early in the course of the disease. Thus in 110 cases in which injections were made within forty-eight hours after the invasion all ended in recovery. On the other hand, of thirty-three cases treated after the eighth day of the disease, eleven were lost. Some of the patients were brought



AN IMPROVED ROENTGEN TUBE.

into the institute in a moribund condition, and six children died within five hours after admission, six more within ten hours; altogether, twenty-one cases (two-thirds of the total mortality) were lost within the first twenty-four hours. As to the effect of the serum on the course of the disease, the first to be noted is:

1. The fall of temperature; in many cases the defervescence was almost critical, and it takes place usually at the end of twenty-four to forty-eight hours.

2. The separation of the false membrane, which takes place as a rule after the return of the temperature toward the normal. Very large casts of the trachea and larger bronchi have been coughed up.

3. Urticaria-like eruptions were observed in very many cases, being in some quite severe and annoying. They, however, disappeared in a few days without any treatment.

4. In four cases marked albuminuria was observed at the time of admission. In these cases albumen disappeared from the urine in the course of the treatment. Pyrexia was accompanied by albumen in the urine, but there was no reason to believe that any renal trouble was caused by the injections.

5. Five cases developed paresis of the soft palate. I wish to note, in conclusion, that microscopic as well as culture examinations were made in every case, and Dr. Kitasato's report only deals with those cases in which Loeffler's bacilli were demonstrated to be present.—Dr. Nakagawa, in London Lancet.

Common Poison Plants.

The Department of Agriculture at Washington is shortly to publish a large illustrated report on poisonous plants, and we are told by the Washington correspondent of the Boston Evening Transcript, who sends to his paper (September 19) an interesting letter on the subject, that it is making original analyses and tests of supposed poisonous plants that are submitted to it, with a view to accounting for many of the mysterious deaths reported every summer from eating unknown plants or roots. The correspondent adds some paragraphs about common poisonous plants, one or two of which we quote below. He says:

"The woods, the meadows, and even the gardens are full of poisonous plants which people generally have no suspicion of. It was never imagined that the common elder was dangerous until two years ago, when five boys near Tarrytown, N. Y., mistook some of the rootlets for sassafras and gnawed the bark. They were all dead within a few hours. . . .

"How many persons . . . are aware that buttercups are poisonous? Yet it is a fact that these blossoms are very dangerous. No cow will eat them, and hence the old notion that the color of butter was produced by buttercups must fall to the ground. Cows do not hesitate to eat hay that contains dried buttercups, because in that condition the flowers are harmless; the poisonous principle, being volatile, has disappeared. . . .

"Fully half of the laurels and rhododendrons are poisonous. 'Lambkill,' so fatal to sheep, is one of the laurels. Trailing arbutus belongs to the same family, but is harmless. . . . The root of the common kidney bean is a powerful narcotic. Comparatively well known as a dangerous plant is the 'jimson weed,' which is often seen by the roadside, conspicuous by reason of its big white flowers. . . .

"One of the wickedest of plants is the water hemlock, which grows rank in moist places; its fleshy roots are agreeable to the taste, though fearfully poisonous; they are rendered yet more dangerous by their resemblance to parsnips and to the roots of the esculent 'cicely,' found in similar localities. The meadow hemlock is believed to be the plant that furnished the poison of which Socrates partook when condemned to death; it grows in fields by the sea and on mountain tops also, bearing large clusters of tiny white flowers; the poison causes headache and imperfect vision, with loss of power to swallow; in large doses it paralyzes the nerves and breathing muscles. The bulbs of daffodils have been boiled in soup by mistake for leeks, with fatal results; to chew even a small bit of one of the flowers is perilous. The bark and seeds of the laburnum are both poisonous.

"One is surprised to learn that many common garden plants are dangerous. The leaves and stems of the potato have narcotic properties. The berries of the potato are extremely poisonous. The skin of old and sprouted potatoes contains a specific poison known as 'solanin.' The young and unripe potatoes which are esteemed such a delicacy in spring by people who can afford to buy them are poisonous raw, but cooking makes them harmless. The flowers of the jonquil, snowdrop and white hyacinth are all bad. The narcissus is particularly deadly; to chew a small scrap of one of the bulbs is apt to be fatal, while the juice of the leaves is an emetic. The berries of the yew have killed many people. Sorrel is sometimes eaten in salads, with distressing results. It is pretty well known nowadays that it is not safe to eat many peach pits or cherry kernels at once."

We have not space to quote the whole of this indictment of the common plants and flowers by modern science. Suffice it to say that it includes the lobelias, wild parsnips, lady's slipper, horse chestnuts, lily-of-the-valley (said to be "fearfully poisonous"), jack-in-the-pulpit, poke root, autumn crocus, the leaves and flowers of the oleander, the bark of the catalpa, the monkshood, and the foxglove, not to mention many varieties of mushroom, some of which, as is well known, are among the most virulent of poisons. In fact, after reading this article one is almost afraid to let a little child run alone into the fields, or even into a flower garden.—Literary Digest.

Large Granite Block.

Much inconvenience is experienced in finding a railroad route from Bellows Falls, Vt., to New Orleans having bridges high enough for the largest block of granite ever quarried in Vermont. The block is 15 feet square and 3 feet thick. It is intended for the noted Moriarty monument in that city. It was quarried in Barre, and has been moved to the dressing sheds. A special car is being built by the local roads, on which it is intended to set the block on edge, allowing the lower side to swing through the bottom, extending to within 8 inches of the rails. The weight of the block exceeds 50 tons. Investigation shows that most routes have bridges too low for the block to pass through.

SIPHON MADE OF A STRAW AND A PEACH PIT.

Bore two holes at right angles in a peach pit, and into each of them fit a straw (one of the straws being longer than the other), and make the joints tight with wax. It will suffice to suck through the longer straw in order to prime the siphon thus formed and cause the liquid to flow.

The same result may be obtained by beveling one of

SIPHON MADE OF A STRAW AND A PEACH PIT.

the extremities of each of the straws and then uniting the latter with a little modeling wax.

We are indebted for the cut and description to La Physique sans Appareils, by Gaston Tissandier.

WE learn from La Vie Scientifique that M. Etienne will shortly introduce in the French Chamber a bill introducing the decimal subdivision of time.

RECENTLY PATENTED INVENTIONS.

Engineering.

PROPELLER.—William M. Tucker, Nelspoint, Cal. According to this improvement a number of propeller wheels are arranged on a shaft extended longitudinally through a chamber along the keel of a vessel, the shaft being supported by bars having their ends removably engaged in recesses in the side walls of the chamber. The propeller wheels do not project below the bottom of the vessel, and are not liable to be raised out of the water when the vessel rides large waves, so that there is little danger of breaking the shaft. The improvement is designed to give a higher rate of speed without any increased consumption of coal.

STEAM FITTING.—Augustus Eichhorn, Orange, N. J. This invention relates to fittings with interior channels for the water of condensation along the side of the pipe, out of contact with the steam, and provides a curved fitting having two openings, the upper portion on the interior side of its outer portion having longitudinal channels running nearly to the center of the fitting, while on the interior side of the inner portion are curved transverse channels leading to the longitudinal channels. The drip water is thus led down the interior side of the outer portion of the fitting, and is led easily to the discharge or lower end of the fitting. The invention is exclusively adapted to fittings in which a single pipe is used to bring the steam to the radiator and carry off the water of condensation.

STEAM ENGINE.—James Barton, Clearwater, Montana (principal owner, Hiram S. Bianchard, Quartermaster General of Montana, Helena, Mont.) This is a duplex engine, with two cylinders side by side, whose piston rods are connected to a common crank shaft. It has no dead center, and it has rotary valves which cut off and cut in the steam so that a volume of one full port will always be exerted on a piston. The valves and cranks are so arranged that the full power of the steam is applied when the crank is on the quarter, and there is no steam pressure exerted and energy lost when a crank is on the center. The governor is connected to the steam controlling valves in such a way that the steam supply is very nicely and automatically regulated, and is entirely shut off in case anything breaks, thus stopping the engine. The reversing mechanism is very simple.

Railway Appliances.

AIR BRAKE COUPLING.—William A. and Benjamin S. H. Harris, Greenville, S. C. This is an improvement on a formerly patented invention of the same inventor, and relates especially to means for operating shifting regulating devices, and so setting them that the valve of the coupling on the end of the car nearest the engine will be held open if cars are broken from the train, so the brakes will be set on the broken off cars. According to the present invention, the shifting regulating devices are operated by air pressure, the valves being controlled by a positively operating device, which operates equally well whether the train be on a level or ascending or descending a grade, and irrespective of the speed of the train.

CAR COUPLING.—Junius L. Pledger, Pelham, Ala. This invention relates to an automatic coupling in which a pivoted link is adapted to couple with another similar coupling, the uncoupling being effected from either car or from the side of the cars. In a slot of the drawhead is a rearwardly sloped latch block, a tripping dog being pivoted in the slot, while opposite the latch block is pivoted an elongated slotted link, a spring pressing the link toward the drawhead. The device is designed to be of very simple, inexpensive construction.

ELASTIC BED PLATE FOR RAILS.—Paul Knoch, Adlershof, Germany. This invention provides a supporting plate made of felt or similar material, but prepared in a particular manner at its upper surface by impregnating with a rubber compound and vulcanizing, so that an upper layer will be hard enough to support the rail without being cut by the rail's edges. The weight of the rail is evenly distributed on the whole surface of the felt support, which is sufficiently hardened by impregnation with suitable substances.

NUT LOCK.—Stephen A Eisele, San Antonio, Fla. This device is adapted for use in securing railway rails in position and for other purposes, the invention providing a clasp plate having near its ends openings for bolts, and having slits leading from the openings and forming tongues. A locking plate is fitted at one edge to the seat of the clasp plate and has its other edge sprung into engagement with a spring portion of the clasp plate.

CATTLE GUARD.—Walter C. Halley, Halley, Ark. To prevent the passage of cattle along the railway from one field to another, this inventor has devised a guard consisting of a pivoted gate mounted at one side of the track, the gate tending to swing transversely across the track, and being moved into such position when an animal steps upon a platform at one side. The gate is thus held closed until the animal steps off the platform, and when the gate closes a cartridge is exploded to frighten the animal away.

Mechanical.

PRINTING PRESS FEED.—Charles S. Sinclair, Cincinnati, O. This invention provides an attachment applicable to the feed table of any printing press, by which the sheets will be picked up from the pile and automatically placed on carriers to be delivered to a take-up mechanism. The invention also provides means whereby sheets to be printed, bags or other articles are placed one on the other, and the uppermost sheets are automatically carried to the position to be engaged by the picker member of the feed. The grippers are operated automatically from a suction pump controlled by the driving shaft of the attachment.

CONVERTING MOTION.—Van Rensselaer McCullough and Morgan McCullough, Vernonia, Oregon. This is a machine or device for converting a reciprocating into a rotary motion, and comprises a frame in which is guided a piston having upper and lower spring pawls and opposing rack surfaces, a power shaft carrying a wheel with a toothed segment on which are opposite spurs alternately engaging the pawls to reverse the power shaft. The machine is designed to be very simple and durable, and permits the direction of the rotary motion to be changed at pleasure.

BRICK MACHINE.—Henry B. Whitehead, Memphis, Tenn. This invention relates to machines employing a rotary table and operated by hydraulic pressure, and simplifies the working parts and operation in such manner that the machine may be operated by an unskilled person. The die compresses the clay in the mould until the pressure rises high enough for the extractor to start the finished brick out of its mould, high pressure only being forced into both the pressure cylinder and extractor cylinder, causing an intermittent action of the dies. A high pressure pump operates the brick pressing mechanism and a low pressure pump operates the rotary table and other parts of the machine.

Miscellaneous.

UPRIGHT PIANO.—Justus Diehl, New York City. This invention provides a lower bridge engaging the front faces of the strings above the hammers and an upper bridge secured to the wrest plank and engaging the rear faces of the strings, the upper bridge being in advance of the lower bridge, so that the strings pass obliquely upward from the lower to the upper bridge, while a sounding board extends upwardly beyond the bridges, the upper end of the sounding board extending behind the wrest plank and being secured independently of it. The improvement is designed to greatly increase the resonant qualities of the instrument, especially when the upper or treble strings are sounded by the hammers.

PROTRACTOR.—Walter W. Pennington, Butte, Montana. This is an improved instrument for use on maps, drawings, etc., and is arranged for the usual adjustment in proper position on the drawing or map relative to the meridian. A blade is pivoted in the center of the body of the protractor, and a pivoted vernier arm is adjustably held on the blade.

UMBRELLA.—Henry Plack, Jr., and Charles H. Pimlott, Johnstown, Pa. This umbrella has auxiliary braces, designed to render it stormproof, and the runners in the tubular stock, connected with the regular and auxiliary braces, are spring-pressed, to make the umbrella self-opening when the lower runner is released from the catch which ordinarily holds the umbrella closed. The springs in the tubular handle are made of one piece and separated by the crossbar of the auxiliary runner.

BROILER.—Alfred Herz, New York City. This device, which may also be used as a toaster, is of simple and durable construction, and adapted to be readily placed in position over the burning fuel in a kitchen stove, carrying off all fumes caused by the broiling, and without danger of deadening the fire. It is made with a casing which extends into the firebox, and is supported from the top of the stove by horizontal flanges, the burning fuel having free access to the bottom and sides of the casing, in which is a reversible grate, while the stove hole is completely closed, so that the draught of the stove is not interfered with. With this improvement meat may be broiled on both sides without the operator removing the casing or having to turn over the meat with a fork.

DOSE-MEASURING BOTTLE.—Alfred A. Law, New York City. This bottle has an inner downwardly extending bend in its neck and an outer bend extending up to the mouth, the bends being at right angles to each other and forming a pocket for the retention of liquid when the bottle is held upright. With this bottle a portion or dose may be divided off from the main contents of the bottle, the dose being delivered from the pocket in the neck by tipping the bottle only slightly.

PUZZLE.—William F. Moore, Plainfield, N. J. This puzzle represents a Norman castle surrounded by a moat over which is a stone bridge, and marbles or other rolling objects represent knights who are to storm the castle, the marbles or balls being shot up inclined planes to cause them to strike a wall and enter the castle, which is considered captured when all the balls are lodged in it.

Designs.

BACK FOR BRUSHES.—Charles D. Graff, New York City. The leading feature of this design is a raised garland of flowers, surrounded by a rococo border in relief, with plain raised surfaces between the border and garland, and the rococo border being extended along the handle portion, while at its lower end is a roselike figure.

SASH WEIGHT.—Robert R. Bren, 18 Cliff Street, New York City. This is a self-adjusting, plumb sash weight, in which the eye at one side is a flared groove ending in a flared recess, while in the opposite side a deep flared recess receives the knot, the two recesses forming a smooth eye. With this eye the weight adjusts itself perfectly plumb as soon as it reaches its place, the smoothness of the eye and the flared groove preventing all possibility of the cord being cut by either the eye or the pulley.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

ANIMAL SYMBOLISM IN ECCLESIASTICAL ARCHITECTURE. By E. P. Evans. New York: Henry Holt & Company. 1896 Pp. 375. 12mo. Price $2 net.

This is an interesting book, bringing to light a vast amount of curious, out of the way information and will prove a genuine mine for the antiquary. The author's aim has been to explain the meaning of real and fabulous animals which have been put to decorative use in ecclesiastical architecture and to, as far as possible, account for their admittance to sacred edifices. The author has accomplished his task with rare success, and it is a pity that such a book, which is evidently a labor of love, must necessarily have a limited audience. The mechanical excellence of the book is on a par with the text. It is beautifully printed on deckle-edged paper and is bound in buckram. There is a bibliography and seventy-eight illustrations and an excellent topical index.

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Notes & Queries

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References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

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Books referred to promptly supplied on receipt of price.

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(7032) D. R. M. says: Will you kindly give me a formula for making a good developer for plates and films, which after using can be put in a bottle and used over and over until exhausted; also a formula for making a solution to soak films in before developing, so they will not curl up. A. Soak films in water containing a small percentage of glycerine. Combined Hydrokinone and Eikonogen Developer:

Sulphite of soda	300 gr.
Carbonate of soda	200 "
Hydrate of soda	30 "
Bromide of soda	5 "
Hydrokinone	20 "
Eikonogen	30 "
Water	10 oz.

This developer possesses the rapid action of the eikonogen combined with the sustaining energy of the hydrokinone, and keeps indefinitely.

(7033) F. C. W. says: Can you give me a receipt for a preparation that will actually kill a corn on my foot? I mean something that is not injurious to me, only to the corn. By answering the above through your Notes and Queries you will not only relieve me, but many others.

A. Salicylic acid	30 grn.
Cannabis Indica (Indian hemp)	5 "
Castor oil	½ drm.
Collodion	½ oz.

The result is a clear light green solution. There should be no difficulty in its preparation. To prevent it from evaporating, keep the solution in a stoppered bottle. Be sure and use the Indian hemp, and not the American article; the latter is not easily soluble. Mix. Apply morning and evening for four days. Then soak the feet in warm water.

(7034) D. W. P. asks an explanation of the differences between a foot square, a square foot and a cubic foot or cube foot. A. A foot square is a surface only of one foot in length on each of its four sides. A square foot is also a measure of surface only, and may be of any figure, provided it contains the amount of surface equal to one square foot or 144 square inches. When the surface is an extended one, the term square foot is used. A cubic foot, cube foot and cubic feet are the terms used for the volume of a body, and signify depth as well as surface; 1728 cubic inches equal 1 cubic foot.

(7035) W. F. C. asks: In making the induction coil described in "Experimental Science," could not single cotton covered wire be used in place of the naked? Would the coil be powerful enough to operate a Tesla disruptive coil? Are better X ray effects obtained by the use of a Tesla disruptive coil? Where can I obtain the works of Tesla? A. For a description, with dimensions and full illustrations, of a Tesla-Houston coil, especially adapted for X ray work, see our SUPPLEMENT, No. 1067. Covered wire can be used in an induction coil in place of uncovered. The Tesla coil is considered especially adapted for X ray experiments. We can supply "The Inventions, Researches and Writings of Nikola Tesla." Edited by Martin. 8vo, cloth; price $4 by mail. Also, Tesla's "Experiments with Alternate Currents of High Potential and High Frequency." Price $1 by mail.

(7036) P. V. B. writes: 1. I am making a Wimshurst machine described in a former SUPPLEMENT of yours. In making the condensers or Leyden jars is it advisable to place loose tinfoil inside, instead of coating with foil? A. It is as well to use both; the inside of the jar should be coated. 2. I find common green window glass responds to the test for plates? Is it advisable to use them as plates? A. The trouble with the glass mentioned is its variation in thickness and its liability to be carved or bent. Otherwise it would be as good as any.

(7037) W. F. W. asks: 1. I have a six cell, bichromate, plunge battery, common form, zinc plate between two carbons. That part of the zinc which dips in the liquid is 4¼ inches long and 2¾ inches wide. Will this battery operate a three inch spark induction coil and give perfectly satisfactory results? A. It is quite sufficient. 2. Should there be any difference in the construction of such a coil intended to be operated by a battery and one intended to be run by a current from a 110 volt dynamo? A. Yes. Higher counter E.M.F. is needed for the 110 volt potential in order to protect the coil from injury. 3. When ordinary illuminating gas, commonly called water gas, is used as a substitute for hydrogen in producing the oxyhydrogen lime light for projection, is the light just as brilliant as when pure hydrogen is used? If not so powerful, please mention its comparative strength. A. Hydrogen is more powerful, it is said, but we have no exact records.

(7038) C. F. H. says: Please say in your next issue of SCIENTIFIC AMERICAN whether any fertilizer for plants or vegetables can be used on the head for starting hair growing. Whether it has been used or is dangerous to the skin. A. We would not advise you to use plant fertilizers on the head. We refer you to formulas for hair tonics in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1071, price 10 cents by mail.

(7039) J. C. P. says: Can you refer to an article anywhere on the subject of the weather glass? I wish to know how these old-fashioned weather glasses containing a liquid that clouds or solidifies under certain atmospheric conditions work.

A. Camphor	2½ drm.
Alcohol	11 "
Water	9 "
Saltpeter	38 grn.
Sal ammoniac	38 "

Dissolve the camphor in the alcohol and the salts in the water and mix the solutions together. Pour in test tubes, cover with wax after corking and make a hole through the cork with a red hot needle, or draw out the tube until only a pin hole remains. Indications of.—1. When the camphor, etc., appears soft and powdery, and almost filling the tube, rain with south or southwest winds may be expected; when crystalline, north, northeast or northwest winds, with fine weather, may be expected; when a portion crystallizes on one side of the tube, wind may be expected from that direction. I had one for several years, and could foretell the weather for a day beforehand with considerable certainty by means of it, even apart from the barometer.—W. J. Lancaster, in English Mechanic. 2. The following indications are from another source: Fine Weather.—The substance remains entirely at bottom of tube and the liquid perfectly clear. Coming Rain.—Substance will rise gradually, liquid will be very clear, with a small star in motion. A Coming Storm or Very High Wind.—Substance partly at top of tube, and be of a leaflike form, liquid very heavy and in a fermenting state. These effects are noticeable twenty-four hours before the change sets in. In Winter.—Generally the substance lies higher in the tube. Snow or White Frost.—Substance very white and small stars in motion. Summer Weather.—The substance will lie quite low. The substance will lie closer to the tube on the opposite side to the quarter from which the storm is coming. We do not consider the instrument anything more than a scientific toy.

(7040) C. Mooney, Secretary Hong-Kong Hotel Company, Ltd., Hong-Kong, China, writes: Will you be kind enough to inform me if you know of any patent bottle stopper contrivance which, while allowing the liquor to be poured from a bottle, will prevent any from being poured into it? We want something of this sort to prevent our bar servants from watering the whisky, etc., and if you can give me any information as to where I can procure such an article, I shall be greatly obliged. A. There have been many patented improvements designed to meet this want, but we cannot undertake to say what manufacturers are putting out a bottle best designed to meet the wants of our correspondent.

(7041) E. H. S. says: 1. Will you kindly give me a formula for a good ink-erasing solution? A. Ink Eraser.—1. Mix equal parts of oxalic and tartaric acids in powder. When to be used, dissolve a little in water. It is poisonous. 2. Oxalic acid mixed with citric acid may be used. 3. Equal parts of cream of tartar and citric acid in solution with water. 2. Also the receipt for yellow and blue lacquer, such as used on fine optical instruments. A. Lacquer.—Ground turmeric as sold, 1 ounce; saffron and Spanish annatto, each 2 drachms; highly rectified alcohol, 1 pint. Place them in a moderate heat, shaking occasionally for several days; then add 3 ounces good seed lac, roughly powdered; shake occasionally until the lac is dissolved. If a deep orange lacquer is required, increase the quantity of annatto; if a bright yellow, decrease it. Lay it on with a brush (warm) as you would pain One or more coats, if necessary. Avoid using too much seed lac, as it has a tendency to prevent the lacquer lying evenly. For a blue lac-

quer add Prussian blue or aniline blue to a thin white shellac varnish.

(7042) E. S. asks for a receipt for cement or paste which will be invisible, for transferring lithographs on to glass without showing any blemish. A. First coat the glass with dammar varnish or else with Canada balsam mixed with an equal volume of oil of turpentine, and let it dry until it is very sticky, which takes half a day or more. The printed paper to be transferred should be well soaked in soft water and carefully laid upon the prepared glass, after removing surplus water with blotting paper, and pressed upon it so that no air bubbles or drops of water are seen underneath. This should dry a whole day before it is touched; then with wetted fingers begin to rub off the paper at the back. If this be skillfully done, almost the whole of the paper can be removed, leaving simply the ink upon the varnish. When the paper has been removed, another coat of varnish will serve to make the whole more transparent.

(7043) W. C. P. says: 1. Will you please advise me as to the best and safest way of removing the top of a carboy? I was thinking of taking a narrow and thin piece of wood just long enough to go around the carboy and fasten it by means of a wire at the proper height as a guide for my glass cutter, then cut it around with the cutter, then use a hot iron or a cord soaked in alcohol. If there is a better way of doing it, please advise me. A. A method consists in the use of what in German is called sprengkohle—cracking coal. The sprengkohle is made of finely ground limewood charcoal. The coal powder is made by means of sufficient gum tragacanth and water into a dough or paste, out of which small cylinders of the size of a pencil are made by rolling between two small pieces of board. Such a cylinder of sprengkohle, ignited at one end, glows slowly. Such sprengkohle may be bought at stores for chemical and physical supplies. It is used as follows: Put a drop of water on the spot where the crack is to begin. Make a short incision with a three-edged file. Wipe the water away. Touch the incision with the glowing sprengkohle, blowing on it if required. After a few seconds the glass will crack for a length of ¼ to 1 inch. If now you move slowly the sprengkohle, the crack follows it. 2. Is there any place I could get a glass vessel about the size of a carboy and the same shape after the top is removed? A. We do not know where you can get such a vessel as you describe.

(7044) M. J. S. says: Will you please explain the formula for making gelatin or glass cards in your Notes and Queries? A. Swell gelatin in cold water for several hours, pouring off the excess. Pour it hot on a plate of glass (previously warmed with steam and slightly greased) fitted in a metallic frame whose edges are just as high as the wafer should be thick. Lay on the surface a second glass plate, also hot and greased, so as to touch every point of the gelatin while resting on the edges of the frame. By its pressure the thin cake is rendered uniform. When the glass plates have cooled, the gelatin will be solid and may be removed. It can then be cut into disks by punches, etc. It can, of course, be colored by adding suitable coloring material, aniline colors for instance.

(7045) W. H. M. asks: 1. Will the Edison-Lalande battery type Q run a two or three candle power lamp? A. A three candle power lamp needs 5·5 to 7 volts E.M.F. For this E.M.F. about ten cells in series would be needed. The resistance of the Q battery is 0·070 ohm. As the lamp has 3·6 to 4·5 ohms resistance and needs a current of 1 to 1·5 amperes, twelve cells in series should answer for the work. 2. About what voltage are the different types of Edison-Lalande battery? A. Mean working E.M.F. 0·667 per couple. As type X includes two couples its E.M.F. is put at 1·333. 3. Would 4 cells dry battery giving 1·5 volts each run the same lamp? A. No; the battery would become polarized too quickly.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

November 17, 1896,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

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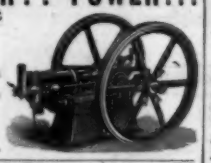

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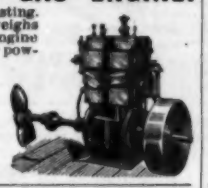

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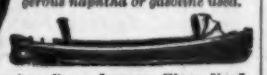

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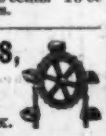

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